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HANDBOOK
OF
SOUTH AMERICAN INDIANS

JULIAN H. STEWARD, *Editor*

Volume 6

PHYSICAL ANTHROPOLOGY, LINGUISTICS AND CULTURAL GEOGRAPHY OF SOUTH AMERICAN INDIANS

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LETTER OF TRANSMITTAL

Smithsonian Institution,
Bureau of American Ethnology,
Washington, D. C., June 15, 1948.

Sir: I have the honor to transmit herewith a manuscript entitled "Handbook of South American Indians. Volume 6. Physical Anthropology, Linguistics, and Cultural Geography of South American Indians," edited by Julian H. Steward, and to recommend that it be published as a bulletin of the Bureau of American Ethnology.

Very respectfully yours,

M. W. Stirling, *Chief.*

Dr. Alexander Wetmore,
Secretary of the Smithsonian Institution.

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PREFACE

The plan and scope of the Handbook of South American Indians and explanations of previous volumes have been given in each volume. This, the sixth and last volume, was originally planned as a part of Volume 5, but had to be held for later publication because of rising printing costs; the index to all six volumes will be published separately.

Like Volume 5, which was devoted to the ethnology of the South American Indians, the articles in this volume are arranged topically and deal with all of South America; but, unlike Volume 5, they cover fields of anthropological research not presented in the preceding volumes or only touched on lightly.

The articles on ancient man in South America in Part 1 give excellent summaries of this little-known subject. McCown's résumé deals with the entire continent, while Frenguelli's discusses Argentina, whose able archeologists have long taken a deep interest in the subject. The somewhat different conclusions reached by these authors show the need for more research on this important subject and for a common understanding on methodology.

Data on physical anthropology were excluded from the first four volumes of the Handbook and will be found in Part 2 of the present volume. The articles on anthropometry by Stewart, Newman, Steggerda, Bastos d'Avila, and Henckel; on deformities, trephining, and mutilations by Stewart; on cephalic deformations by Imbelloni; on pathological changes by Stewart; on pigmentation and hair by Steggerda; and on Mestizos by Steggerda and by Pourchet are standard summaries of available knowledge on these subjects. The articles on blood groups by Boyd and on basal metabolic rates by Wilson summarize the meager work heretofore done on these topics. Many other subjects, though coming within the scope of physical anthropology in recent years, have been omitted for lack of sufficient research. Articles by two Chilenos, however, "The Geographical Pathology of Chile," by Ernesto Herzog, and "The Physical Anthropology of the Internal Organs Among the Races of Chile," by Carlos Henckel, represent new approaches. Some day these subjects may be treated on a continental scale. The bibliographic references additional to those cited by the authors of articles on physical anthropology and the antiquity of man in South America have been added by Dr. T. D. Stewart, editor of Part 2.

The field of South American linguistics is particularly difficult, not only because of the great diversity of Indian languages but because many languages are already extinct and but few of those which survive have been adequately recorded. Previous classifications, such as those of Schmidt, Chamberlain, Rivet, and Loukotka, are in serious disagreement with one another as to the classification of many important groups. In Part 3 of the present volume, J. Alden Mason has done a monumental job of ascertaining the best modern opinion on the linguistic affiliation of each South American tribe and preparing an up-to-date classification. Time permitted very little original research on the relationship between groups which now appear to be linguistically isolated. The 75 or more now isolated languages will undoubtedly be reduced in the future, and affiliations with Central and North American languages will certainly be established. Such regroupings, however, will require years of research in comparative studies, which in turn must rest upon adequate field material gathered from surviving linguistic groups.

The tribal map (map 18), on which the linguistic map is superimposed, was compiled by the editor from the data contained in the first four volumes of the Handbook. The tribes are located where they were first reported by the Whites. In the Antilles and coastal areas of South America, their whereabouts was recorded during the first half century of the Conquest; in some of the more remote areas, such as parts of Mato Grosso, the tribes were unknown until the past 50 years. In order to combine tribes and languages on a single map, it was necessary to draw tribal boundaries. In most cases, these boundaries are fairly arbitrary; in some, where tribes were intermixed or had interlocking distributions, the lines drawn on the map falsify the picture. It is necessary, however, to simplify such detail and to have definite boundaries at which the language colors stop.

On the whole, map 18 agrees with those published in previous volumes; but, as certain conflicts between the other maps had to be reconciled and as many locations had to be plotted on the American Geographical Society millionth maps, the editor takes full responsibility for the present tribal map.

Both the linguistic classification and the tribal map are deeply indebted to the late Dr. Curt Nimuendajú. Dr. Nimuendajú went to Brazil in 1906, and, though he first explored the tropical forests as an engineer and cartographer, his deep interest in and sympathy for the Indian soon led him to make anthropological studies. During the past 40 years, his contributions to the anthropology of Brazil have surpassed those of Koch-Grünberg, Von den Steinen, and the few other ethnologists who have done serious work in South America. As a linguist, he furnished data for many new classifications; as a cartographer and ethnologist, he provided the basic tribal maps for most of eastern Brazil.

Part 4, Geography and Plant and Animal Resources, provides a background for the cultural articles. Carl Sauer's article on "The Geography of South America" describes the natural landscape. Raymond M. Gilmore's "Fauna and Ethnozoology of South America" is an entirely original work, giving taxonomic and ecological data on both the wild and domesticated animal resources of native South America. It also provides an excellent summary of the problem of domestication of the llama, alpaca, guanaco, vicuña, guinea pig, and Muscovy duck. Claude Lévi-Strauss' appraisal of the wild plants of value to the Indian in tropical South America is a very original and highly useful summary of the considerable plant resources, many of which are of great importance also to the modern population of the country.

Carl Sauer's article on the South American native domesticated plants is the most complete summary of this subject yet published. Sauer includes the findings of plant geneticists, whose work is not only placing taxonomy on a more sure basis but is providing important clues to crop origins and history. For example, the genetic connection of such a plant as Peruvian cotton with Old World species throws new light on theories of transoceanic influences on New World cultures.

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For supplying the illustrations contained in this volume, we are indebted to the following individuals and institutions: Carlos Henckel, Joaquín Frenguelli, José Imbelloni, R. M. Gilmore, Clark Yeager, Sulo Sihvonen, João Moojen de Oliveira, Rollo H. Beck, Jonathan Sauer, J. B. Lippencott Co., the United States National Museum, the National Zoological Park, Washington, D. C., and the New York Zoological Society.

As in previous volumes, our gratitude must be expressed to the Strategic Index of the Americas, Yale University, and to the Translating Bureau, United States Department of State, for translating several of the articles. The editors translated others of the articles.

We are particularly grateful to Senhora Maria Alice Moura Pessoa of the Museu Nacional de Rio de Janeiro for performing the tremendous task of preparing the linguistic map, under the general direction of Dr. J. Alden Mason. Special thanks are also due Dr. Mason for classifying and tabulating the languages of South America, a task of inconceivable magnitude, and to Dr. T. D. Stewart for serving as editor of the section on physical anthropology. We are also grateful to Mr. John Buoncristiani, for preparing the base map used for the geographical, linguistic, and other principal maps, and to Dr. Robert West for helping assemble the geographic data entered on the geographical maps.

JULIAN H. STEWARD, *Editor*.

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VOLUME 6. PHYSICAL ANTHROPOLOGY, LINGUISTICS, AND CULTURAL GEOGRAPHY OF SOUTH AMERICAN INDIANS

PART 1. ANCIENT MAN

THE ANTIQUITY OF MAN IN SOUTH AMERICA

By THEODORE D. McCOWN

A hundred years of collecting and laboratory research concerning the problem of the antiquity of man in South America has provided no incontestable published evidence of high antiquity for any manner of hominid on that continent. This is not an opinion; it is the result of methodically testing the alleged evidence in the form of discoveries of human skulls or bones or the products of human workmanship against a set of standards that in other parts of the world have proved their merit and utility by repeated and successful use in the fields of geology and human paleontology in separating the genuine facts from the spurious or imaginary ones. The unimpeachable occurrence, or especially a succession of occurrences, of human bones or human artifacts in a geological formation concerning whose several parts geologists are agreed upon as to their time relations affords the most secure evidence upon which the investigator of paleoanthropological problems may work. Where the foregoing type of geological evidence of antiquity fails, the comparative analysis of well excavated vertebrate faunas, especially mammalian ones, provides the next best evidence of the age of the deposits yielding human remains. The validity of the method of interfaunal analysis needs no defense, but it can have no secure basis unless one member of the items compared is datable in terms of an accepted geological succession, and it too often fails to provide as definite chronological information as does the data of geology. Use of the same method involving the study of the morphology of the human remains, or the comparative analysis of artifact assemblages, provides another category of evidence. This must take third position, however, because it is too frequently the outcome of uncritical or biased use, or misunderstanding, of the methodology which produces it, not because it is of less intrinsic value.

The osseous human remains and the artifacts of human manufacture which we have to examine have been accumulated mainly by European and South American scientists over a period of about 100 years. Two principal areas have provided the greater part of the material. The first and the most important from the standpoint of quantity of material is the Argentine one with Buenos Aires Province in first position. New specimens continue to appear, particularly from the formations which form the south coast of the province, while the growth of the educational centers in the cities of Rosario, Santa Fé, Tucumán, Córdoba, and Mendoza seems directly related to the increasing number of discoveries of "fossil" man or his culture in the Argentine hinterland. The bulk of this paleoanthropological material, however, was collected in the years between 1875 and 1915, either through the efforts of Florentino and Carlos Ameghino or as a result of the world-wide interest they aroused in the question of man's antiquity in Argentina. Patagonia and Tierra del Fuego perhaps should form a special zone to the South of the Argentine one proper. Among recent investigations in this area, Bird's (1938 a, 1938 b) careful work in habitation sites deserves close attention. The modesty with which his conclusions have been presented rather obscures the importance of the data.

The second region is more compact geographically and lies in the highlands of Minas Gerais Province in Brazil about 250 miles north and a little west of Rio de Janeiro. The Danish explorer Lund collected extensively in the caves of the Lagoa Santa district of Minas Gerais between 1835 and 1844. The human material recovered by Lund was, with the exception of one skull which is in Rio de Janeiro (Lacerda and Peixoto, 1876), transported to Europe, where the larger part was acquired by the Zoological Museum of the University of Copenhagen. Eighty-five years later, in 1926, further investigations of the caves were initiated by the Museu Nacional of Rio de Janeiro (Walter et al., 1937) and have since been continued by the Academy of Sciences of Minas Gerais situated at Bello Horizonte. The remaining paleoanthropological material from South America is scattered and possesses unity only insofar as it is putatively ancient.

The literature, both special and general, which is concerned with the antiquity of man and his artifacts in South America is voluminous. No attempt has been made to present an inclusive bibliography. The older literature up to 1910–11 is fully presented by Hrdlička et al. (1912), while Quenstedt and Quenstedt (1936) cover both the older and the newer literature through 1934. The bibliography accompanying Simpson's paper (1940 b) should be consulted for the geological and nonhuman paleontological literature. Vignati (1941)

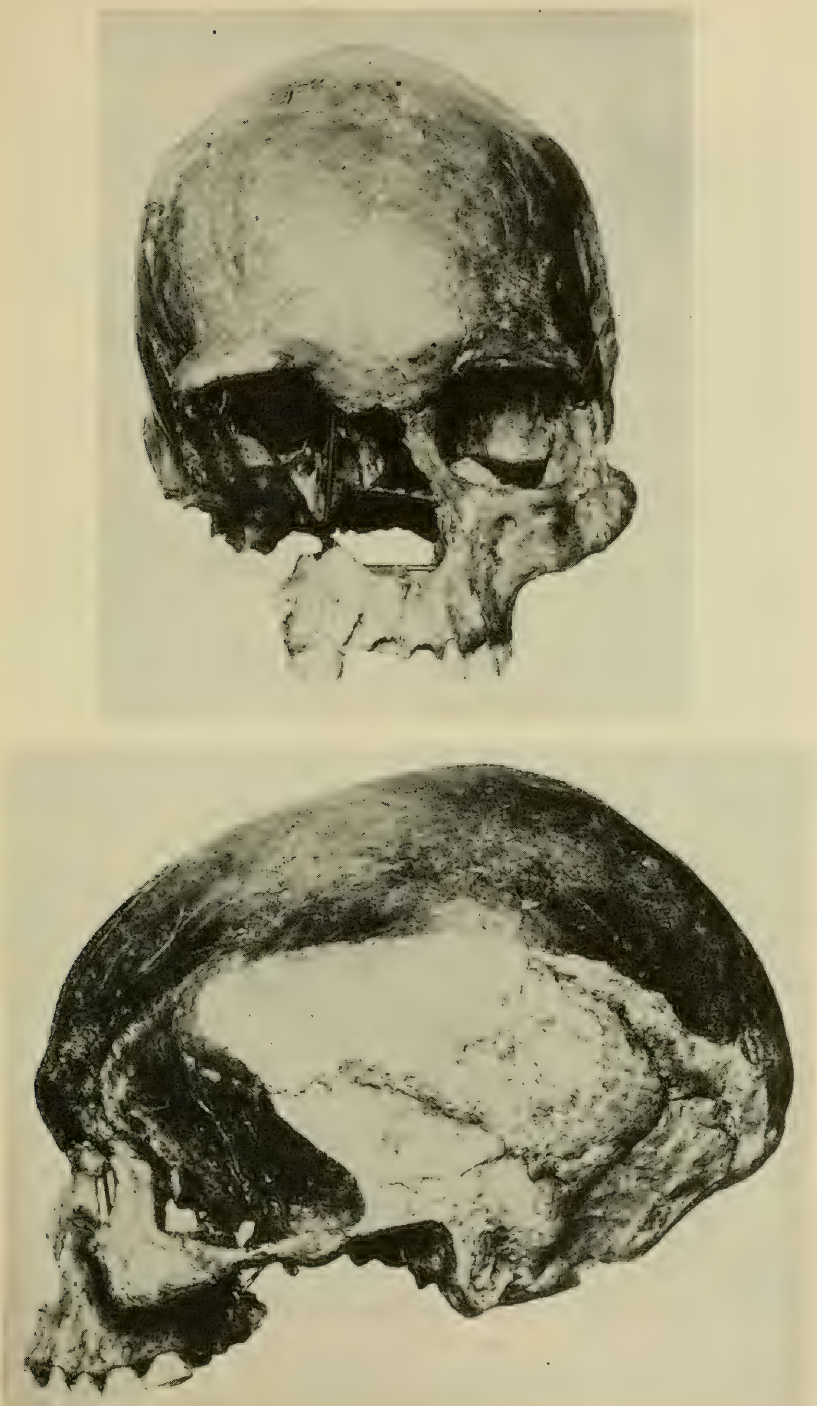

Plate 1.—The Ecuadorean Punín skull (frontalis and lateralis). (Courtesy American Museum of Natural History.)

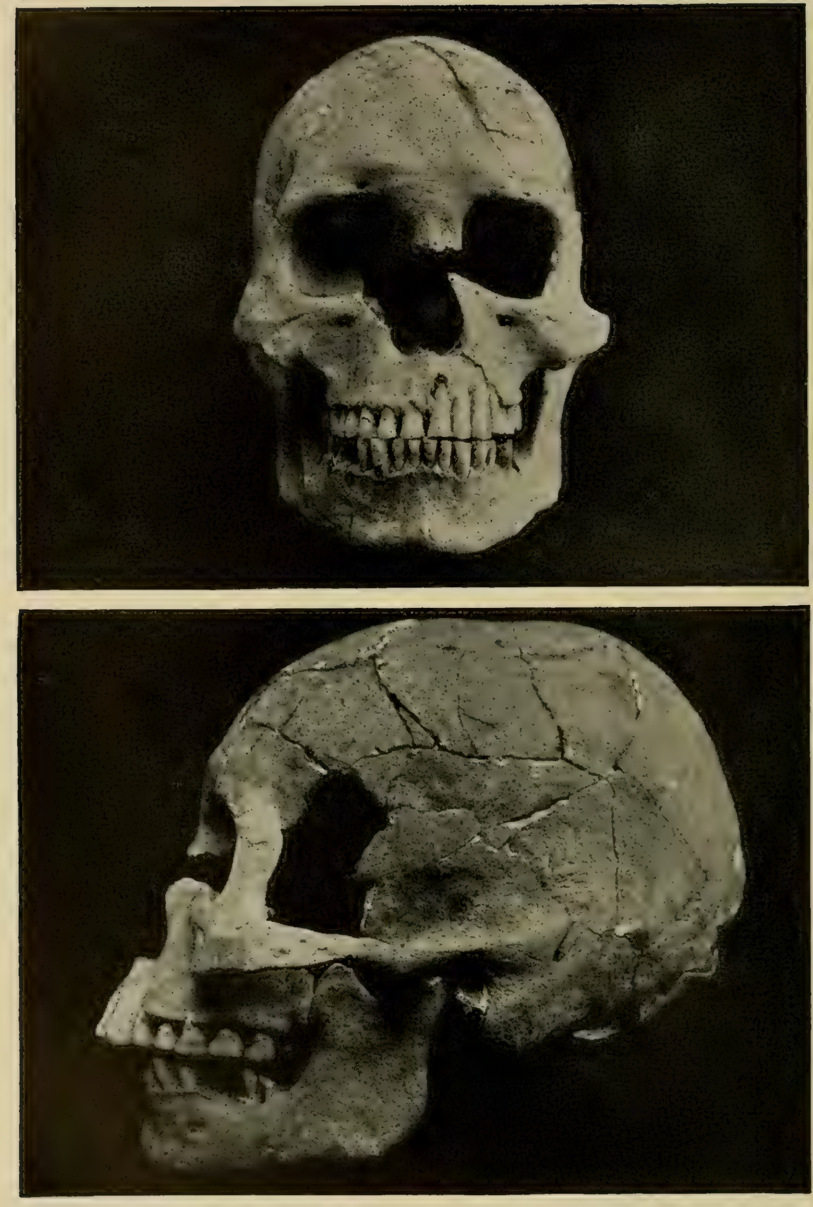

Plate 2.—The Brazilian Confins skull (frontalis and lateralis). (From "Early Man," 1937, courtesy The Academy of Natural Science, Philadelphia, and J. B. Lippincott Company.)

gives a useful critical bibliography mainly concerned with the discoveries at Miramar (Buenos Aires Province) but also includes a large number of other fundamental papers. Hrdlička (1935 b) presents an excellent bibliography in the general field of native American racial origins. Unless otherwise indicated, the citations included in the above papers or memoirs are not listed in the bibliography which accompanies this study. The "Bibliography of Fossil Vertebrates" (Camp and Vanderhoof, 1940; Camp et al., 1942), Sellards' papers (1940, 1947), and the "Bibliographie Américaniste" published annually in the Journal de la Société des Américanistes de Paris have proved valuable sources.

A sober and disinterested consideration of the many publications describing the original material demonstrates that little real progress in reaching positive answers to the basic problems has been made in the last 35 years. Especially in Argentina, the status of the problem as of the year 1910 and the lines along which further work might be done were fully and fairly set forth by Hrdlička, Holmes, Wright, Fenner, and Willis (1912) and their conclusions need be but briefly recapitulated here. It is only in a negative sense that progress can be described. The Ameghinian scheme of human evolution based upon hominid material derived from Miocene and later strata is not now generally accepted by any serious student. The *Tetraprothomo* atlas and femur came from what Ameghino regarded as the base of the Upper Miocene. When subjected to critical examination, the atlas proved to be inseparable morphologically from the same bone among modern races and more particularly the native American ones. The femur is indisputably nonhominid and may reasonably be considered as derived from a member of the Procyonidae (Bordas, 1942; Cabrera, 1936). Ameghino's views concerning the human remains of Pliocene age have suffered a variety of revisions. The most important is the clear demonstration, principally by Hrdlička, of their unquestioned inclusion well within the limits of variation among the modern types of man, particularly American Indians. This is now generally admitted by modern workers although there persists a strong tendency to emphasize the "primitive" features of the morphology of new human osseous specimens. In large part, this tendency is a natural consequence of the assumed geological antiquity of the material.

The age of the Pampean and post-Pampean formations has been generally revised upward. A recent review by Simpson (1940 b) is concerned primarily with the Tertiary formations and is essential to an understanding of what seems to me to be the primary test of antiquity: agreement as to the geological succession and the time relations of the respective units. On Kraglievich's scheme, specimens ranging from the Monte Hermosan to the lower Pampean are of Pliocene age. Frenguelli, on the other hand, seems to resolve the improbabilities of Pliocene forms of *Homo sapiens* by regarding the Monte Hermosan, Chapadmalalan, and the whole of the Pampean formations as Pleistocene in time. The addition to these uncertainties of the fact that the conditions under which both the older and the newer specimens occur are usually susceptible of more than one interpretation leads to the same negative and pessimistic conclusions which Hrdlička and others reached over 30 years ago.

As specific examples let us examine two instances, both described by Professor Vignati (1931 a, 1934, 1941) with technical ability and a wealth of detail. The first concerns the fossil man of Esperanza, an incomplete skull and skeleton found casually in 1919 in the bank of the Rio Salado north of Santa Fé. It is not apparent that any trained investigator was responsible for the original removal of the remains before they were translated to Buenos Aires. The deposit from which the skeleton was obtained is considered to be equivalent to the Lujanan and of Late Pleistocene age by Frenguelli (Vignati, 1934, p. 12, note 2). The Lujanan is usually regarded as post-Pampean (Recent) by other workers. Dr. Frenguelli discovered in the same region, but at a different locality, an "arrow point" formed from a cervid antler tip. The original publication concerning this artifact (Vignati, 1931 a) describes it as coming from the Ensenadan (basal Pleistocene according to Simpson), but it is included in the report on the human fossil (Vignati, 1934 a) as a sample of Esperanza man's handicraft and is, in consequence, assigned a Late Pleistocene date. The possibilities of a burial having been made in an older deposit are never considered. The mere presence in the same horizon of some extinct mammals is not decisive as to age. The initial assumptions that a human skeleton was in some fashion naturally incorporated in a Late Pleistocene stratum can readily be seen to rest on not one solid piece of evidence.

The second instance concerns the two "fossil" human teeth from Miramar (Vignati, 1941); really an occasion which Professor Vignati has taken to review the finds from the Chapadmalalan (Chapalmalense) horizon along the seacoast of Buenos Aires Province. Following Frenguelli, this formation is considered to be of Pleistocene age, although there is better evidence for regarding it as Late Pliocene. There is no reason to doubt that the two human molars came from the Chapadmalalan stratum but the assumption is made that they were incorporated in the deposit by natural processes in the course of its formation. Too easily is it forgotten that for at least 50 millenia men have lavished varying degrees of ingenuity on the problem of disposing of their dead. Interment in the earth has few analogies among normal geological processes; rather it seems to be at complete variance with them and at the same time the results are not always easy to distinguish. The long controversy over the East African Oldoway skeleton is one well-known instance which is now happily settled.

Bailey Willis (Hrdlička et al., 1912) four decades ago made a series of suggestions concerning further investigation of the various parts of the Pampean. These envisaged a combination of stratigraphic, petrographic, and climatic studies that in their essentials are similar to the studies made by Wayland (1934), Nilsson (1932), and others in East Africa.[1] The paleoanthropological literature concerned with ancient man in South America gives no evidence that either anthropologists or geologists have systematically undertaken such studies. Granting that the evidences of man's handiwork and his own bones have not been adventitiously introduced into the Chapadmalalan, we still have no convincing explanation of how they were incorporated in the deposit. Whether one considers the Chapadmalalan Pliocene or Pleistocene is of minor import in this connection, for the human remains would still be the earliest known evidence of hominids from any part of the world, and yet not archaic members of the Hominidae but quite positively *Homo sapiens*. The accumulating evidence with regard to man's evolution obtained in the Old World makes the above situation improbable in the extreme. Consequently, the extended comparisons of the two molar teeth leading to the conclusion that they represent a species of man distinct from *Homo sapiens* and attributed to the *Homo neogaeus* of Lehmann-Nitsche seems a labor of doubtful value.

Recent years show some slackening in the rush to describe new "Paleolithic" industries. Perhaps in this field, more than any other, greater abuses were made of translating the data of form and function of implements into evidence for time relationships with the Old World. Sellards' fine paper (1940) gives evidence of what has been accomplished as it relates to the same problem in North America.

The Brazilian discoveries of ancient man which include the Lagoa Santa crania and skeletal parts and the Confins man (pl. 2) (Walter et al., 1937) have a putative antiquity based not on pure geological evidence but on their association with certain Pleistocene "type" mammals. Hrdlička (Hrdlička et al., 1912) has gone fully and critically into the question of the fossil-mammal associations with the human remains. The undoubted association of man with certain mammals that are more characteristic of the Pleistocene period than of the present-day fauna is no longer a matter of serious dispute (Sellards, 1940, 1947). Colbert's review (1942) of these associations in the New World as a whole underlines this proposition, but he succinctly points out that the paleontologist's current view holds this to mean that some Pleistocene "type" elements of the fauna survived into Holocene times, not that man, especially *Homo sapiens*, was necessarily ancient in any part of the New World. Bird's evidence (1938 b) and Uhle's (1930) report on the Alangasí mastodon also incline one to this view. Both Simpson and Colbert in the previously mentioned papers indicate what any reflective student knows: the concept of a Pleistocene-Holocene "boundary" is primarily a classificatory one and not a physical reality. The attempts to give chronological precision to the several and regionally varying phases of the transition from Pleistocene to recent times and their indifferent success again emphasizes the desirability of working backward from the known to the unknown when the time units are centuries and not scores of millennia.

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[1] For a brief introduction to the African literature, see Leakey (1926), especially the bibliography to Chapter I. Outstanding work along the same lines has been done in north India and China.

The above considerations do not affect the importance of the Lagoa Santa skulls [2] as anthropological documents but they do raise serious questions, not yet settled, as to the imputed antiquity. Yet the presumptive antiquity of these specimens has played an important part in causing them to become the cornerstone of the most curious kind of intellectual edifice. That able and clever partisan, Paul Rivet, promoted them to racial status in 1908 [3] in connection with a description of 17 crania from rock shelters near Paltacalo in Ecuador. The suggestion that the Lagoa Santa crania represented a special type, long and high headed, was not original with Rivet, but to him belongs the distinction of presenting what has since passed as proof of the racial status of the type. The 17 Ecuadorean crania represent the 17 longest and highest-headed skulls of 78 undeformed and measurable crania collected from several sites of indeterminate age in southern Ecuador. Rivet explicitly disavows having "selected" his 17 skulls but it seems curious that the seriation of the cephalic indices coincides with the numerical seriation of the specimens. It is not surprising, therefore, to find a high degree of homogeneity among the 14 males of the 17 specimens. The metrical and indicial comparisons with the Lagoa Santa series (maximum size of series, 18 specimens, both male and female) is precisely set forth, and particularly in vault dimensions and indices the correspondences are quite close. The Paltacalo skulls have thus acquired a fuzzy aura of antiquity and the Lagoa Santa crania have become the homotypes of a new "race" consisting of about 35 examples.

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[2] The Confins discovery needs full and detailed publication. The brief reports (Walter et al., 1937) gave promise of resolving in part the lacunae in Lund's evidence (Hrdlička et al., 1912) but there appears to be some difference of opinion in Brazil with regard to the significance of the Confins specimen (Serrano, 1938, p. 86).

[3] Hrdlička (1935 b) gives a full bibliography on this matter, while the earlier studies of the Lagoa Santa material is covered exhaustively in "Early Man in South America" (Hrdlička, Holmes, et al., 1912). Rivet expounds his views fully and with no essential modifications in "Los origines del Hombre Americano" (1943 b).

The next step is a reexamination and revision of the racial position of the Pericue skulls and osteological material from Baja California which Rivet published in 1909. The Pericue series, 18 crania, are put through their paces and shown to be unquestionably one branch of the Lagoa Santa race, but they also have resemblances to the narrow, high, and small-headed "race" of Melanesia and Australia. The implication is that the racial relationship is an ancient one; here again the Lagoa Santa material extends its inferred high antiquity to still another situation, this time in North America.

The further developments in this interesting intellectual construction are faithfully set forth by Hrdlička (1935 b). These involve linguistic and cultural evidence of intercourse across the Pacific, published from 1924 onward. There is further racial evidence: a recent *Tunebo* skull serves as the occasion for Professor Verneau (1924) to demonstrate that some aboriginal Colombians show an Oceanic Negroid strain. Lebzelter (1925) and Gusinde (see Stewart, 1943 a), both alone and together, in a series of monographs toy with the idea of Australoid physical traits among the Fuegians but never fully commit themselves. The edifice continues to grow: on the physical side new additions are made by Eickstedt (1934), Imbelloni (1937 b), Count (1939, 1941); on the cultural side, by a host of authors who ignore the reasoned judgments of Boas (1925, 1929), Nordenskiöld (1931), and Dixon (1933). Here our concern is with the biological evidence; when the imposing façade is stripped away we find the framework to be the veriest piece of jerry-building. The initial demonstration of the "race" of Lagoa Santa is based upon material that a properly trained modern anthropologist cannot but regard as utterly inadequate. The fewer than 50 crania that served as the cornerstone for the present construct would scarcely represent an adequate sample, even if we were to suppose it was derived from a single population with known cultural characteristics and from a specific timepoint in human history.

The calvarium from Punín (Sullivan and Hellman, 1925), assigned to the Pleistocene of Ecuador, exhibits a complex of morphologically primitive anatomical features (pl. 1) that have led the authors who described it not only to note its resemblance to the Lagoa Santa crania but to raise seriously the possibility of its Australoid-Melanesoid racial affinities. They further suggest that the main problem depends upon which view one accepts with regard to the unity or possible plurality of origin of the American Indian. The evident sterility of results in using this approach seems clearly to show that it is tackling from the wrong end the matter of achieving a solution to the question of Indian racial origins. With a single specimen of exceptional physical conformation it is patently essential to find out first what its relations are to the norms, the limits of variation, and the internal variability of well-studied series of native American crania whose temporal and cultural associations are likewise of record. If the divergence metrically and morphologically is great, then is the time to seek extra-American relationships. The all too usual procedure has been to look first for relationships abroad. If all of the "fossil" men had been as competently, impartially, and speedily investigated as was the "Cuzco Man" (see Hrdlička, 1918) several hundred specimens would now have no more than a mild antiquarian interest.

The preceding paragraphs have gradually drawn further and further away from the question with regard to the antiquity of man in South America. This is inevitable because the related but not identical problems of the earliest traces of human beings in the New World, and their racial, cultural, and linguistic origins have been interwoven from the very beginning of both popular and scientific interest in the Indians. No rigid separation of the two is either needful or fruitful, but it is essential to bear in mind that the solution of the problems of the time and the manner of arrival of man must be antecedent to any valid study of origins, be they racial or cultural. Chronological relationships based upon the criteria of form and function, whether applied to skulls or pots, shinbones or bronze pins, are notoriously subject to a margin of error that varies with the training and with the temperament of the individual investigator. Given quantitatively adequate assemblages of archeological or skeletal material whose time relationships to other series are known, the archeologist or physical anthropologist may then have some expectation of ultimately obtaining valid conclusions concerning origins and ancestral connections. The analysis of material whose principal point of reference is that it occupied or was associated with a given point in space but whose point on a time scale is unknown is a legitimate subject for investigation but it falls outside the field of history and the antiquity of man in South America, and the origins of the native peoples of that continent are clearly historical problems.

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THE PRESENT STATUS OF THE THEORIES CONCERNING PRIMITIVE MAN IN ARGENTINA

By Joaquín Frenguelli

The problem of "fossil man" in Argentina was stated a century ago when A. d'Orbigny (1835–47, vol. 3) maintained that at least part of the mud layers on the pampas dated from the same period as the deposits in the caves of Brazil where Lund and Clauser had found human skeletons mingled with the remains of *Platyonyx*, *Hoplophorus*, *Megatherium* and *Smilodon*.

The question was raised in a more direct manner, years later, when F. Seguin (1863) found, in excavations near the abutments of a bridge over the river Carcarañá, human remains associated with the *Arctotherium* bones and other typical forms of extinct animal life of the pampas.

In both cases, there was doubt as to the authenticity of the relationship. In support of Seguin's discoveries, for the first time H. Burmeister (1866) maintained that it was a case of accidental commingling of more recent vestiges of indigenous life with the remains of diluvian mammals. This gave rise to an endless controversy which still continues without producing any definite results, much less a reasonable harmony of opinions.

The central and most prominent figure in this long dispute was, without any doubt, F. Ameghino. This famous paleontologist made his first discoveries in 1870; from then on he continued to repeat them in various places and at different times almost to the very end of his arduous life in 1911. The Ameghinian theory is well known in every detail. Preceded by Patagonian ancestors of the lower (*Pitheculites*), middle (*Homunculus*), and upper (*Anthropops*) Eocene period, the first Hominidae had appeared in the southern region of the pampas during the Miocene (Hermosense) with *Tetraprothomo argentinus* (atlas of Monte Hermoso), the first link in an evolutionary chain which doubtless continued in the upper Miocene with *Tripothomo* (hypothetical), in the lower Pliocene (pre-Ensenadense) with *Diprothomo platensis* (skull from the harbor of Buenos Aires), and in the middle and upper Pliocene (Ensensadense-Lujanense) with the series *Prothomo* and *Homo pampaeus* (crania from Miramar and Necochea, Baradero and Fontezuela, Arrecifes and Ovejero, etc.), now endowed with well-developed psychic and morphological human characteristics. Finally, at the dawn of the Quaternary era (post-Lujanense hiatus), *Homo sapiens* probably reached his full development in the vicinity of Buenos Aires and from there spread through the rest of America and the world.

Today no one shares the Ameghinian theory in its entirety. It is no longer believed that the Patagonian *Homunculídeo* of the Tertiary era represent the direct ancestors of the pampan Hominidae. The evolutionary chain of earlier plain dwellers has been broken in as much as both partisans and opponents recognize that human remains unearthed from the strata of the pampas belong in their entirety to the genus *Homo*. Finally, no one now admits that the soft clay on the pampas belongs completely to the Tertiary era. Nevertheless, Ameghino's theory cannot be forgotten, not only because of its historic value as an achievement which in Argentina and elsewhere greatly stimulated scientific investigation and so stirred the opinions of his time, but also because of the influence it exercised on the later unfolding of the problem.

In truth, up to the present, the question of primitive man in Argentina has always stemmed from the Ameghinian idea, only to develop in two opposite directions and to arrive at antagonistic conclusions. On the one hand, it is admitted that the American aborigine could have been native and that his ancestors, while not so far remote as Ameghino claimed, evolved during the pampas age, totally or partially Quaternary, along with the mammals which were so characteristic of the same geological period. On the other hand, it is argued that the Argentine aborigines, like their kin throughout America, are more or less recent immigrants and that, consequently, the anthropological remains dug from the pampas belong to these immigrants who were accidentally (through removal or burial) interred with the remains of *Typotherium*, *Toxodon*, *Mastodon*, *Megatherium*, *Megalonix*, *Glyptodon*, etc.

Within this second trend of ideas the opposite extreme was reached by reducing all the American peoples to one race and searching for the origin of their stock among the Egyptians, Sumerians, Chaldeans, Phoenicians, Trojans, Basques, Tartars, Chinese, etc. According to A. Hrdlička, for example, his "American homotype" was probably derived from Mongoloids who, moving from the extreme east of Asia, reached the far west of America through Bering Strait and from there no doubt scattered as far as Patagonia and Tierra del Fuego. Elliot Smith, however, held that a "heliolithic civilization" leaving Egypt crossed Asia and the Pacific, and then, moving from island to island, reached America and, in its spread toward the south, was deterred only by the inhospitable barrier of the Antarctic ice sheets.

Along the same trend of thought but on a more logical basis, other authors maintained that the peopling of America could have been accomplished only by successive waves of anthropologically and ethnographically diverse elements, in different periods of time and from many different regions. Among those who upheld this idea we may name Griffith Taylor, R. B. Dixon, Von Eickstedt, E. W. Count, and others. However, in order to keep within hypotheses which have more direct bearing on the problem in Argentina, it is more appropriate to mention P. Rivet and J. Imbelloni.

The theory of P. Rivet (1924 e, 1926 a, 1926 b) derives from an old idea of G. d'Eichthal concerning the predominance of the "Oceanic races" in the peopling of America, and of the ties between "Oceanics" and Americans, which have been verified by well-known ethnographers and corroborated by his own investigations in the fields of anthropology, ethnography (archeology), and linguistics. On this basis he claims that the peopling of America was effected through Pacific water routes, in different eras and by countless waves of ethnically different elements, whose origin must be sought in the extreme southeast of Asia and in the Indo-Malayan Archipelago. Furthermore, he declares that the first arrivals of these elements on the coasts of America occurred in an epoch no earlier than the end of the Quaternary, i. e., when the continent's present contours had already become fixed.

With this theory Rivet denies the authenticity of the discoveries attributed to paleolithic man in America in general and in Argentina in particular; further, he does not accept any route from hypothetical Atlantic and Pacific continents of pre-Quaternary times. Again the complete ignorance throughout all of pre-Columbian America of the use of iron and writing, as well as of no less fundamental elements, such as the wheel, glass, wheat, etc., enable him to deny flatly any theory which, for the populating of America, resorts to ancient inhabitants of the Mediterranean area and to direct influences from civilized peoples of eastern Asia.

According to Rivet, the principal groups which contributed successively to forming the primitive population of America were, in the order of their arrival, the following: An Australian element; an element of Malayo-Polynesian speech resembling in physical characteristics the Melanesian group; an Asiatic element in which can be distinguished a Uralian (*Eskimo*) admixture; and a Sino-Tibetan (*Na-Dene*) element. Rivet does not fix the dates of the successive arrivals; but, on the suggestion of A. Mendes-Corrêa, supposes that the first inhabitants, the Australians, landed in the extreme south of South America and wandered along the borders of the Antarctic during the recession of the ice sheets, at the time of the postglacial optimum approximately 6,000 years ago.

Along similar ideas, Imbelloni's theory also considers the peopling of America as the result of countless migratory waves in different epochs from the Pacific and near-Pacific regions. He disagrees, however, on essential points. Like Rivet, he denies both the "American homotype" of Hrdlička's pan-Mongoloidism and Ameghino's monogenism; but he explains the great number of American races by new arguments, including serology, and he admits, although vaguely, that America, like the rest of the habitable world, might have sheltered human life from the time of the Pleistocene age. He contemplates a primitive Australoid prototype, but conceives it as evolving from an archaic human creature which dominated the Asia-Pacific world and which spread through America from north to south, to the very limits of Tierra del Fuego. He accepts a Malayo-Polynesian contingent, but separated into numerous elements of very dissimilar type. And he adds another migratory element: the Indonesian, source of the *Mayan* civilization (and its derivatives).

Imbelloni's theory is that with the passing of time these different groups appeared in succession with the following physical characteristics: Short dolicoids, Tasmanian in appearance and culture, from whom evolved the *Fuéguido* and *Láguido*; tall dolicoids, Australoids, nomadic hunters from whom the *Plánido* and *Pámpido* developed; ultra-dolichocephalics of short stature, Melanesoids, hunters and gatherers, together with less pronounced dolicoid elements of the proto-Indonesian type, weavers and agriculturists, from whom originated the *Amazónido*; brachycephalics of medium height, Mongoloids, bringers of higher forms of agriculture and of patrilineal institutions, represented by the *Pueblo-Andino*; ultra-brachycephalics and brachycephalics artistically endowed and the creators of states, from whom stemmed the *Istmido* and their metastases; finally, the last contingents, *Colúmbido* and *Eskimo*.

Since 1919 the author of this paper has tried to establish certain concepts which he believes fundamental for the future solution of the problems dealing with primitive man in America, at least in Argentina. By studying the upper soils on the pampas and discovering human remains in various levels of the series which they composed and in different localities in the provinces of Buenos Aires, Córdoba, and Santa Fé, he thought to have proved that here actually lived an ancient human race, from the beginning of the sedimentation of this series, together with the more representative mammals of its fauna. But in contrast with F. Ameghino and on the firm basis of geological, paleontological, and climatological arguments, he tried to show that the different levels of the loess series in Argentina (Pampeano) belong as a whole to the Quaternary era; i. e., the Chapalmalense, the Ensenadense, the Bonaerence, and the Lujanense to the Pleistocene age, and the Platense, the Cordobense, and the Aimarense to the Holocene (fig. 1). He denied, however, the existence in Argentina of remains of Hominidae in the Tertiary era. He declared, on the other hand, that the fauna contemporary with primitive man of the pampas is, in spite of its archaic appearance, relatively recent, and that its last vestiges became extinct during the course of our era. He proved, in truth, that since the Chapalmalense period, at the base of the stratigraphical series, this native fauna, formed by remains of Tertiary mammals, was mingled with numerous representatives of an immigrant fauna which is certainly of the Quaternary era.

In his opinion, up to the present there are very few human skeletal remains which belong to the lower and middle Pampian period: they are restricted to the two molars of the Chapalmalense, which Vignati (1941) has recently described at length. They appear somewhat more frequently at the end of the Pleistocene (Lujanense), showing those Australoid characteristics recognized in the so-called "Lagoa Santa Race." They become more numerous in the Holocene (*Platense-Cordobense*) with the brachycephalics of the "race of llama-raisers." Finally, they occur in great numbers in the Aimarense period, at the threshold of our time, with the modern polymorphs.

By contrast, industrial remains appear with relative frequency from the base of the series (Chapalmalense period) and continue in almost uninterrupted succession to the present, especially in some levels (Ensenadense, Lujanense, and Aimarense) of the Atlantic coast. Judging by technolithic methods, the different industries do not indicate successive links in an unbroken chain, but rather expressions of independent cultures. In all of them, however, Mousterian types are dominant, from the crudest to the most highly developed forms, which perhaps indicate a single source of successive migratory waves. But at the same time, evident admixtures of ethnically different elements probably resulted, especially during the Ensenadense period, in which there appear articles of bone, and during the Aimarense period (the uppermost of the series), wherein for the first time appear microliths, bifacial implements, crude pottery, and, subsequently, a limited use of copper.

The beginning of this last phase would seem to mark the start of new ages and of recent migratory currents, which may well be those which Imbelloni considered, at least, the departure of his Melanesian and proto-Indonesian contingents. In any event, it would seem certain that there was a Paleolithic age in the pampas region of Argentina, whose first forms appeared in the Chapalmalense period, i. e., in an epoch probably contemporary with the Sanmeniense period and the site where the *Sinanthropus* was found in Asia. Otherwise, it would seem strange that so vast and favorable a continent as America

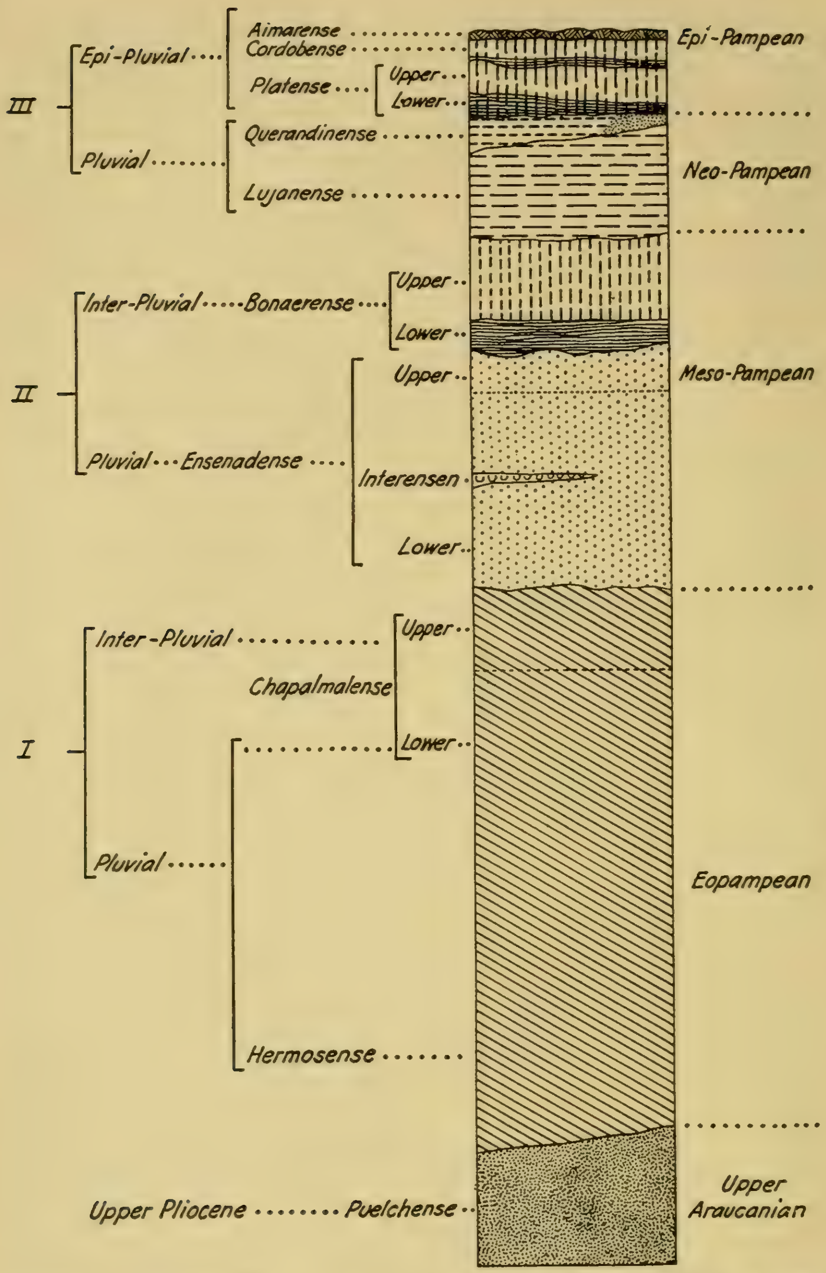
III
Epi-Pluvial
Aimarense
Cordobense
Platense
Upper
Lower
Pluvial
Querandinense
Lujanense
Epi-Pampean
Neo-Pampean
II
Inter-Pluvial
Bonaerense
Upper
Lower
Pluvial
Ensenadense
Upper
Interensen
Lower
Meso-Pampean
I
Inter-Pluvial
Chapalmalense
Upper
Lower
Pluvial
Hermosense
Eopampean
Upper Pliocene
Puelchense
Upper Araucanian

FIGURE 1.—Diagram of geological column of the Argentine Pampa. (Redrawn from Frenguelli, 1939, fig. 2.)

had remained closed to the Paleolithic Ecumene while an enormous interchange of mammals was going on between America and Asia and vice versa.

Vignati shares these beliefs, disagreeing only in details of minor importance; other authors, however, continue to believe that part of the deposits on the pampas still belong to the Pliocene period and that, therefore, Argentina was the cradle of humanity during the Tertiary era.

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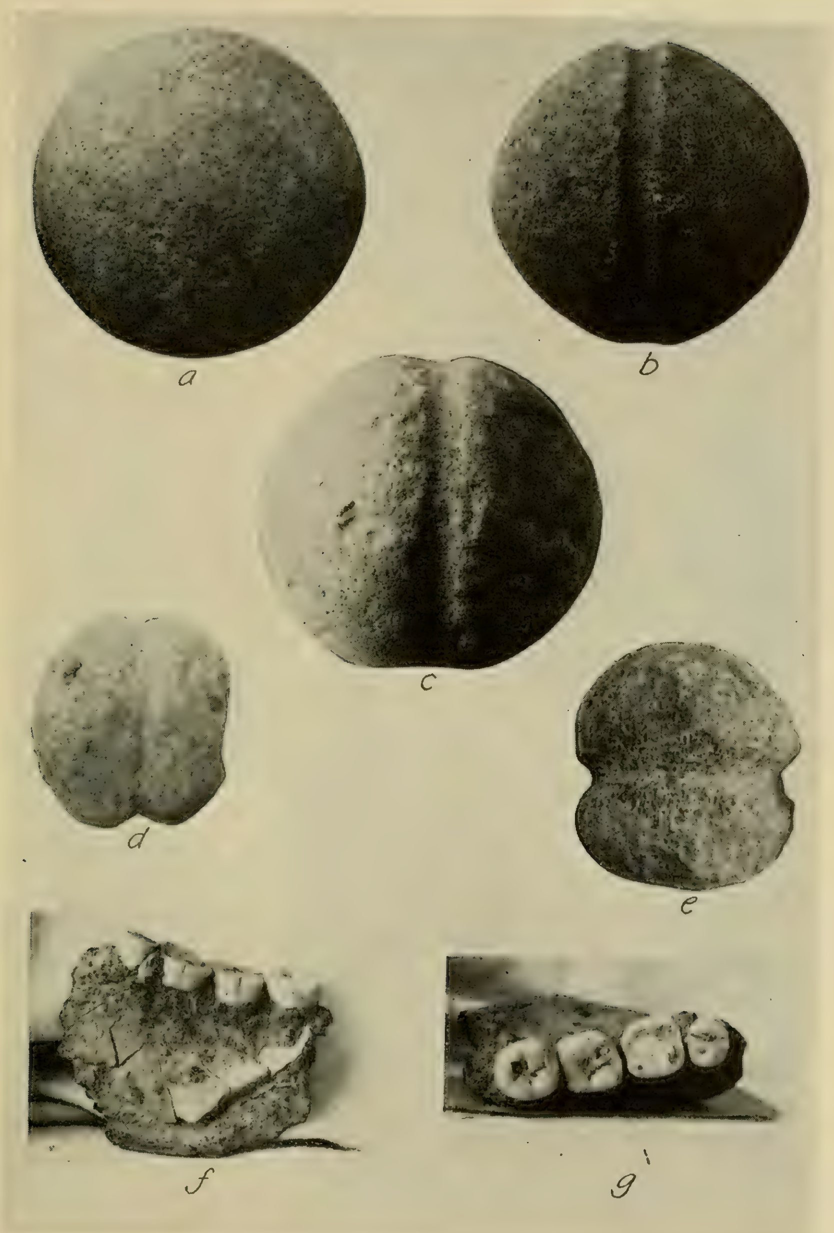

PLATE 3.—Bolas and human teeth from Argentina. *a*, *b*, Bolas of the recent Indians, Miramar, Buenos Aires. *c*, Bolas of quartzite of the Chapalmalense, Miramar, Buenos Aires. *d*, *e*, Bolas of hard, calcareous material and of animal bone, respectively, of the Ensenadense, Miramar, Buenos Aires. *f*, *g*, Lateralis and verticalis views of a human mandible fragment (note dental caries) of the Lujanense, Arroyo Cululú, north of Esperanza, Santa Fé. (Courtesy Joaquín Frenguelli.)

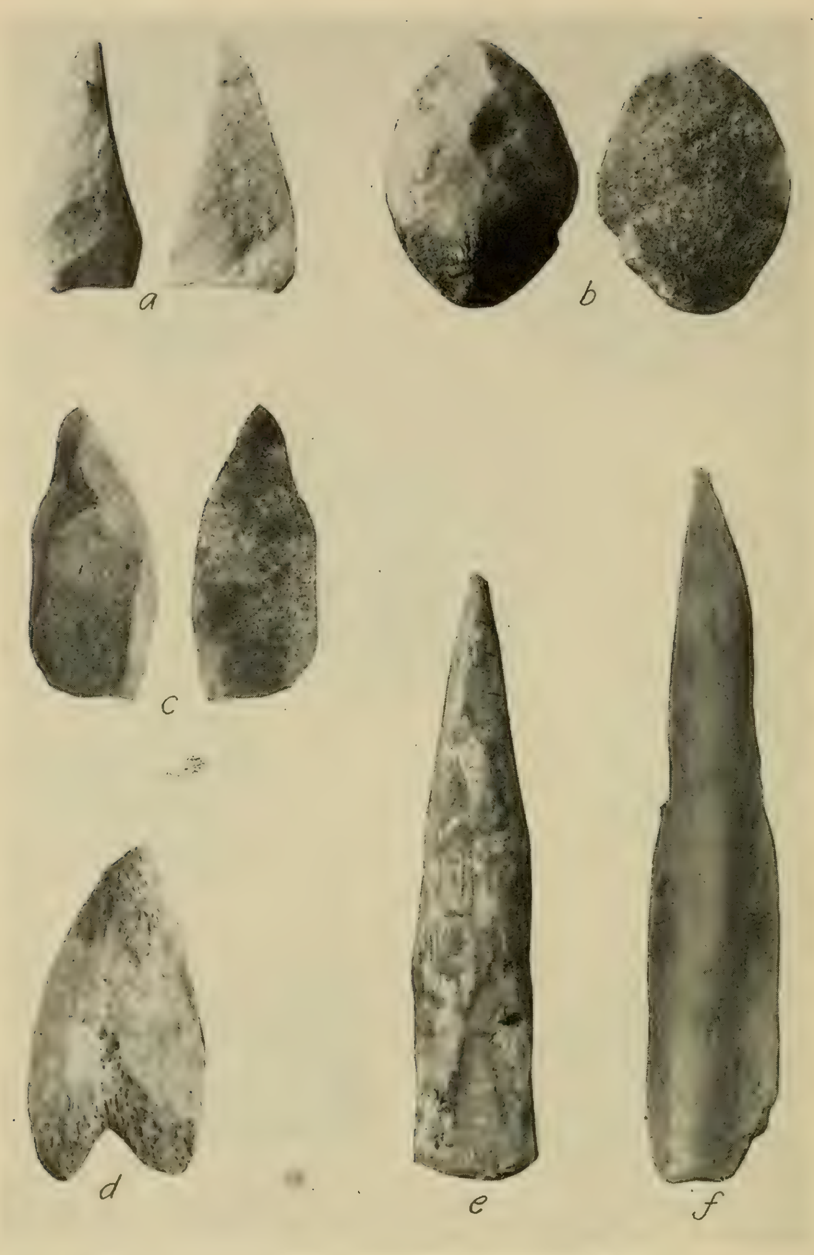

PLATE 4.—Stone and bone points from Miramar, Buenos Aires. *a*, *b*, Anterior and posterior views of triangular and ovate quartzite points of the Chapalmalense. *c*, Anterior and posterior view of a porphyritic point found in a calcareous concretion of the Chapalmalense. The dissolution of the concretion has given the specimen a calcareous patina. *d*, Point made of a mammal bone, from the Ensenadense. *e*, Lance point made of mastodon (*Stegomastodon*) tusk, from the Ensenadense. *f*, Lance point made of glyptodont (*Sclerocalyptus*) rib. (Courtesy Joaquín Frenguelli.)

PART 2. PHYSICAL ANTHROPOLOGY

SKELETAL REMAINS OF SOUTH AMERICAN INDIANS

ANTHROPOMETRY OF SOUTH AMERICAN INDIAN SKELETAL REMAINS

By T. D. STEWART and MARSHALL T. NEWMAN

Any review of the measurements of Indian skeletal remains from South America should recognize the errors inherent in these measurements. The only data on some series go back to the beginnings of the present-day techniques; to Virchow and Broca, the founders of rival schools. Other series have been described by followers of one or the other of these schools, who, however industrious and conscientious, had no direct training in technique. In addition, some of the reports fail entirely to indicate how the measurements were taken or give only average indices.

As would be expected also where a multitude of observers have worked more or less independently, their individual biases in sexing the specimens and in the identification of artificial deformity have introduced irregularities into the data. Pervading all of the records, therefore, is a certain unreliability, which no amount of statistical analysis can evaluate or overcome. Unfortunately, South America, unlike North America, has not had an Hrdlička to sample the remains from the different regions and make reliable comparisons both within the continent and throughout the hemisphere. This is one of the greatest needs in this field.

Because of these deficiencies in the records and because so many areas are not represented at all, owing to the practice of cranial deformity or poor preservation of the remains, only the broader distributions of the main physical traits will be shown here. Skeletal parts other than the skull have received relatively little attention, so this review will be restricted to the skull.[1] The cranial series that have been found suitable for this purpose are listed with their sources in table 1 and are located by serial number on map 1.

Maximum length of skull.—This measure usually is taken from

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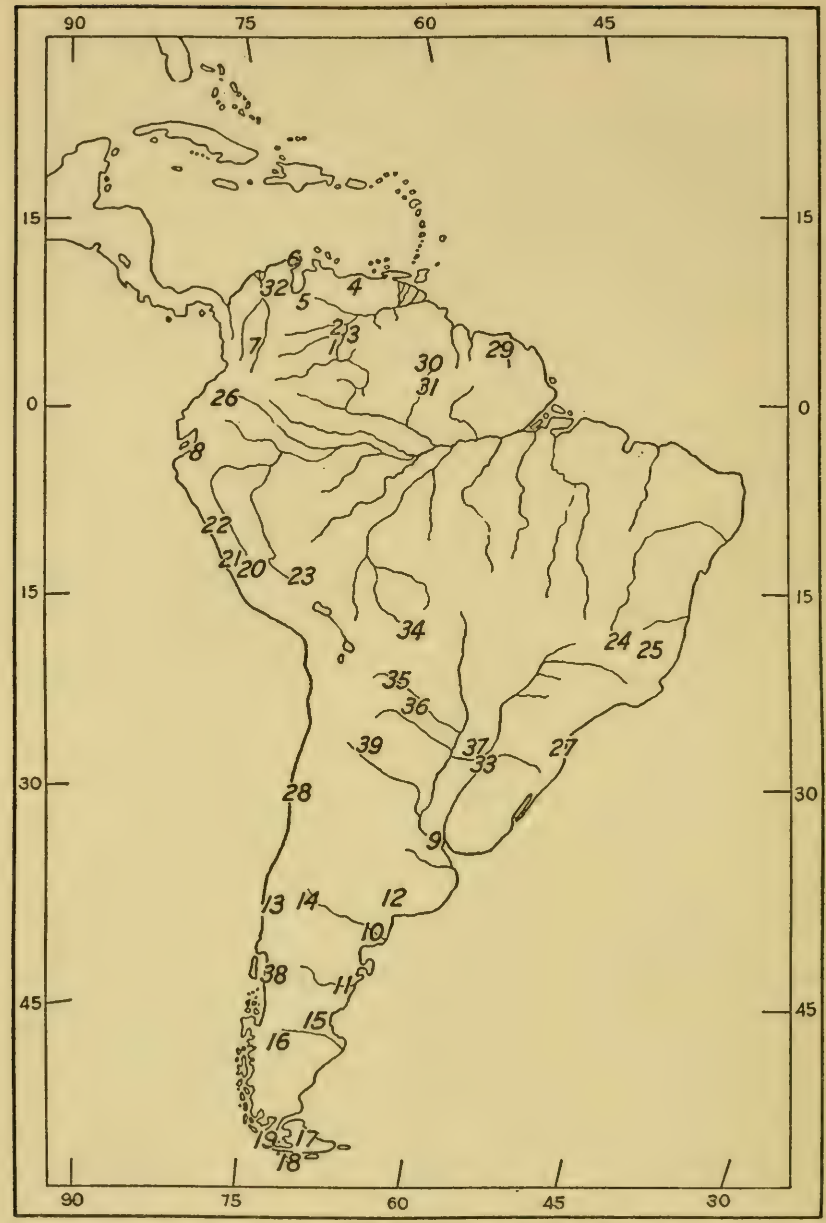
[1] The main references to the skeleton are listed at the end of this article.


90
75
60
45
15
15
0
0
15
15
30
30
45
45
6
32
4
5
2
3
1
7
30
29
31
26
8
22
21
20
23
34
24
25
35
36
37
39
33
27
28
9
13
14
12
10
38
11
15
16
19
17
18
90
75
60
45
30

Map 1.—Base map of South America showing locations of cranial series listed in table 1.

glabella anteriorly to the posterior-most part of the occiput, wherever this may occur, or in the midline. Occasionally, ophryon is used as the anterior landmark. (Cf. Flower, W. H., 1907.) Although there are slight variations resulting from these different techniques, in general the records of this measure are fairly comparable. Aside from technique, however, length of the skull is affected (most often decreased) by artificial deformities.

The selected records are given in table 2 by descending order of size in the males. It will be observed that the first 6 series—the longest heads in the absolute sense—are from Argentina or the islands to the south belonging to Argentina and Chile (Tierra del Fuego). Indeed, of the first 12 series all but one are from the East and Southeast. On the other hand, the last 10 series—the shortest heads—are all from the West and Northwest. This distribution can mean a difference either in the shape of the head (dolichocrany or brachycrany) or in the general size of the head in these 2 areas. It will be seen from the other measurements and from the indices below that these regional differences are due chiefly to size.

Maximum breadth of the skull.—The accuracy of this measure depends upon obtaining the maximum wherever it occurs above the temporal ridges. The qualification is not always observed. As in the case of the length, the breadth is affected (usually increased) by artificial deformities.

The selected records, arranged as usual in the descending order of size in the males, are presented in table 3. Again the Argentine and Tierra del Fuego series predominate among the first series—the absolutely broadest heads (all but 3 of the first 12). And of the last 10 series—the narrowest heads—all but 3 are from the West. The 3 exceptions in the latter distribution are all from Brazil, and these, according to table 2, are also long-headed. Here, then, the narrowness is due to shape and not size.

Skull height from basion.—The records are not always clear as to how this measure was taken. In the majority of cases, it is clearly stated to be basion-bregma; but in those in which the methods of the German school have been followed, it is often either vertical height or maximum height. The differences are not very great in any of these methods.

According to the records presented in table 4, the highest heads are largely in the East and Southeast (9 of the first 11 series), whereas the lowest heads are in the West and Northwest (all but 1 of the last 14 series). This distribution is the same as for length and breadth and likewise may be due to shape or size. Because all 3 diameters are large in the East and Southeast and small in the West and Northwest, it is obvious that there is a corresponding distinction in general size of the skull in these 2 areas (see cranial module). It will be shown below, however, in connection with the mean height index that the distinction regarding height also holds relative to length and breadth; or in other words, relative to shape.

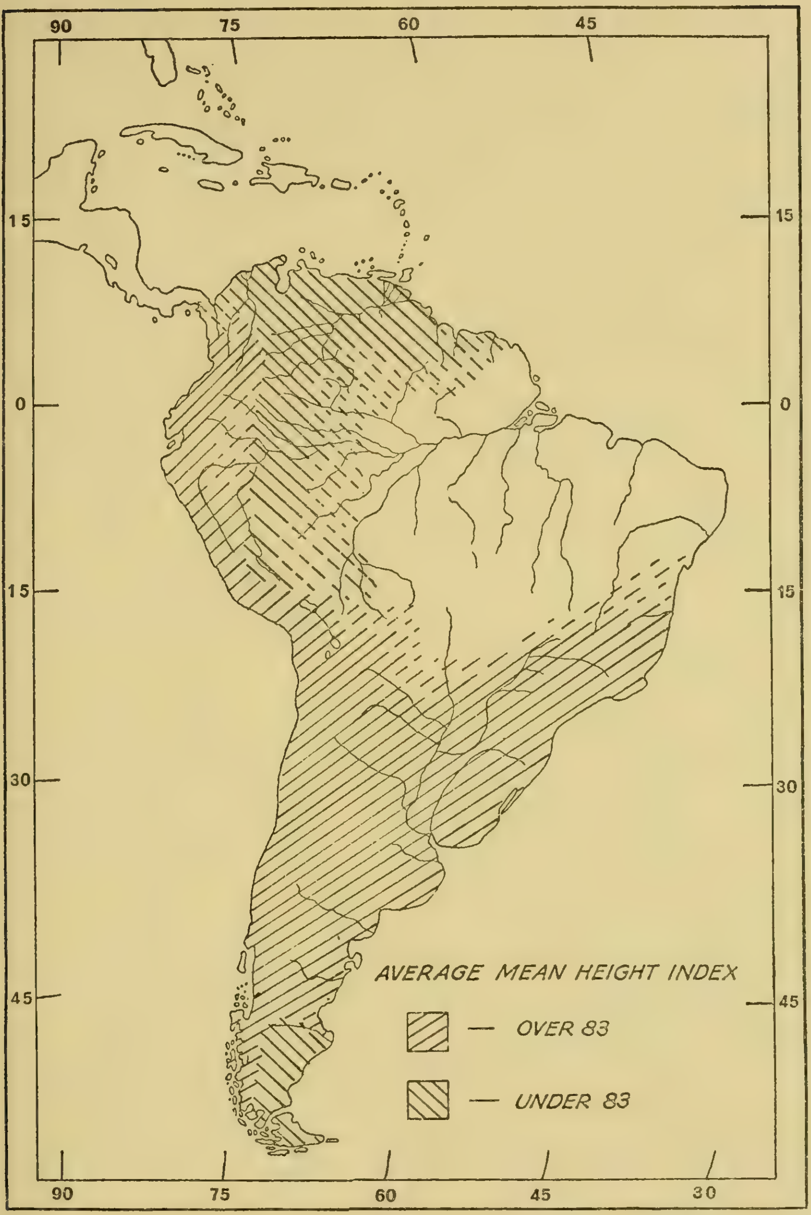
Cranial index.—The reliability of an index depends upon that of each of the measures entering into the ratio—in this case length and breadth. Cranial indices in the upper 80's and above usually indicate deformity.

Table 5 contains several records (series 29–38) in addition to those given in the preceding three tables. However, it is apparent that there is not the same clear geographical segregation of horizontal head shape as of head size. For instance, the six records for Peruvian males extend from 75.5 to 80.3; the eight for Argentina proper from 73.7 to 81.0—almost the full range for the continent. The most dolichocranic (71.4) group—also perhaps the most ancient—is that from Lagoa Santa, Brazil (No. 24). The series from Paltacalo, Ecuador (No. 8), selected by Rivet for its resemblance to Lagoa Santa, has an identical average index, but this rises to 75.0 (range 67.4–82.6) for the total combined undeformed males and females. The fact that the lowest indices tend to occur in the East, where the practice of deformity is very little developed, suggests that there may be an inclusion of slightly deformed skulls in the so-called undeformed series from the regions where this practice is or has been present.

Mean height index.—The two standard indices of skull height—length-height and breadth-height—tend to vary with the cranial index and, unless considered carefully together, do not give a full expression of relative height. (Cf. Stewart, 1942 a.) To overcome this objection the mean height index of Hrdlička, which relates height to the mean of the length and breadth, will be used here. This index has the additional advantage of saving printing space, since it substitutes one figure for two.

As already pointed out in connection with absolute height, relative height shows a clear regional variation (table 6). The lowest heads, relatively speaking, are localized for the most part in the North—in eastern Colombia, Venezuela, the Guianas, and northern Brazil, with a small extension into eastern Perú. All the rest of the continent, except the southernmost tip, is occupied by high-heads. This distribution, which is shown on map 2, has been discussed elsewhere (Stewart, 1943 d).

Cranial module.—The mean of the three main cranial diameters gives a convenient measure of cranial size. The detailed data will not be given here because they can be calculated from tables 2, 3, and 4. In general the average module ranges from 148.8 to 158.6 mm. in males and from 140.5 to 150.8 mm. in females. Using 152 in the males as an arbitrary dividing point between large and small skulls, which


90
75
60
45
30
15
0
15
30
45
AVERAGE MEAN HEIGHT INDEX
— OVER 83
— UNDER 83

Map 2.—Generalized distribution of the extremes of the mean height index in South America. This is based upon the data in table 6 (sexes combined).

corresponds to about 145 in the females, the distribution shown on map 3 results. Here the distinct segregation by size already indicated by the individual measurements is clearly demonstrated.

Capacity.—As usually taken, cranial capacity is subject to a considerable personal error from technique. Although some of this error tends to cancel out in large series, there is often an accumulating bias that results in an average that is higher or lower than the true value. Differences in sexing also influence the results, but deformity seems to have no effect. These factors are illustrated by the Zavaleta collection from the Calchaquí region of Northwestern Argentina (table 7, series Nos. 39 and 39a), the two equal parts of which have been described independently by Kunike (1911) and Constanzó (1942 a). According to their respective sexing and methods of taking capacity, Constanzó averages 50 cc. higher in the males and 90 cc. higher in the females than does Kunike.

The records in table 7, faulty though they may be, reflect the distribution of head size already pointed out. Thus, of the first 15 records, 11 are from the East and Southeast, whereas of the remaining 11, 9 are from the West and Northwest. This distribution of capacity probably could be anticipated from that of head height, which has a high correlation with capacity.

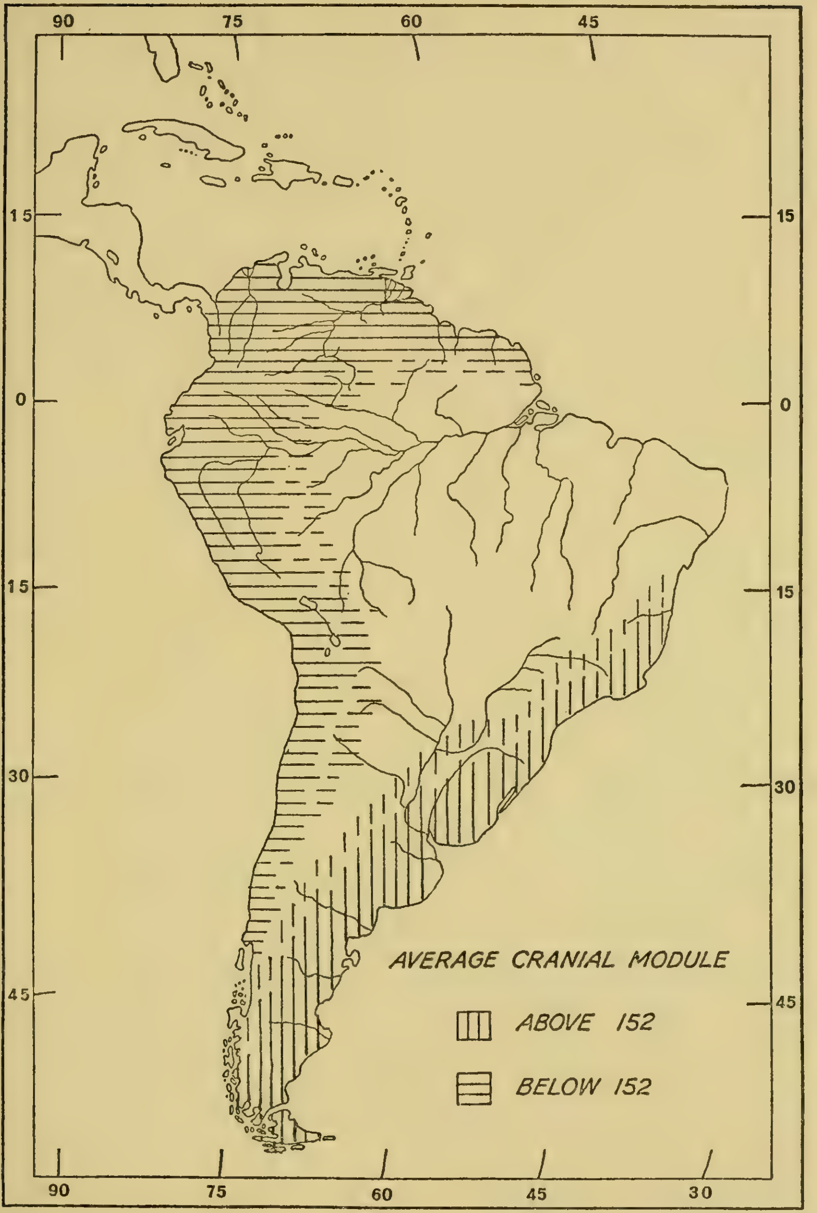
Upper face height.—The distance between nasion and prosthion or alveolar point is not recorded in many of the earlier records. The chief error that enters into this measure involves the location of the alveolar point and the estimate of damage thereto from tooth loss.

Of the available records presented in table 8 again the highest figures are from the East and Southeast (all but one of the first nine) and the lowest figures are from the West and Northwest (all of the remaining nine).

Maximum face breadth.—There should be little error in obtaining the bizygomatic diameter, unless it is in locating the maximum.

The records given in table 9 repeat the finding of size distribution: the highest figures are from the East and Southeast (all but 1 of the first 12); the lowest figures are from the West and Northwest (all but 1 of the remaining 18).

Upper facial index.—The total variation for the averages of this index is only about 5 or 6 units, as compared to about 10 for the cranial index and the mean height index. Nearly this whole range is found within any one area. Thus, of the records listed in table 10, those from Argentina range in the males from 51.0 to 54.2; those from Perú from 49.8 to 53.1. This indicates that, although both the measures entering into this index are larger in the Argentine series than in those from Perú, each pair of measures varies in about the same ratio. The geographic segregation so evident for these measures is only


90
75
60
45
30
15
0
15
30
45
AVERAGE CRANIAL MODULE
ABOVE 152
BELOW 152

Map 3.—Generalized distribution of the extremes of the cranial module in South America. This is based upon the data in tables 2 to 4 (males only).

slightly evident in the records of the index, but appears to be in the same direction.

Orbital height.—The diameter of an opening can be measured usually with a minimum of error. This is true in the case of the orbital height, except that the borders of the orbit are not always sharply defined and practices vary as to whether the height is taken vertically or at right angles to the long axis.

It will be seen from table 11 that the range of the reliable means is not very great—about 3 mm. in the males. This small range allows greater prominence to errors of sampling and technique and hence may obscure somewhat the geographic distribution of size. It is perhaps significant, however, that all but one of the figures for Argentina and Tierra del Fuego range from 35.1 to 36.4 in the males, whereas all but one from Perú range from 33.5 to 34.9.

Orbital breadth.—There are three landmarks on the medial side of the orbit—lacrymale, dacryon, and maxillofrontale, any one of which may be used in measuring breadth. Lacrymale gives the smallest measure and maxillofrontale the largest. Dacryon, slightly more medially placed than lacrymale, is probably most commonly used, although the records are seldom specific on this point.

Table 12, which has been restricted so far as could be determined to records of orbital breadth measured from dacryon, shows much the same narrow range of means as table 11. Here again differences in technique and in adequacy of samples possibly obscure the true geographic distribution of size. Comparing the same groups singled out under orbital height, it will be seen that all but three of the series from Argentina and Tierra del Fuego range from 39.0 to 41.5 mm. in the males, and that all but one from Perú range from 36.8 to 39.5 mm. There is thus some indication of a geographic segregation of orbit size similar to that characterizing the larger skull diameters.

Orbital index.—It is difficult to determine how much of the 16-unit range for the males in table 13 may be due to the variations in technique pointed out in connection with orbital height and breadth or to inadequate sampling. The first three records, being excessively high, may be due to one or other of these factors; and perhaps the same is true of the last record, which is unusually low. Omitting these four records, the total range is cut in half, or to 8 units. Within this range very little if any geographic segregation is evident. Thus the reliable male records for Argentina and Tierra del Fuego run from 87.5 to 91.9 and those from Perú run from 86.0 to 91.7.

Nasal height.—The reliability of this measure suffers from the fact that one of the landmarks, the inferior limit of the nasal aperture, is not clearly defined. A variation results depending upon whether the measurement is taken to the floor of the nasal cavity, to the spine, or—in case a gutter is present—to one of the borders.

The records given in table 14 show a geographic segregation which is too distinct to be the result of technical differences and which is in line with the distributions shown by other measurements. Of the first 15 records—the longest noses in the absolute sense—all but 4 are from the East and Southeast, whereas of the remaining 16—the shortest noses—all but 2 are from the West and Northwest.

Nasal breadth.—Since this measure is the diameter of an opening the edges of which are sharp, it is usually obtained with a minimum of error.

The total range of the means of the larger series shown in table 15 is very small, probably not over 3–4 mm. Nevertheless, some geographic segregation is discernible. Thus, of the first 15 records—the broadest noses in the absolute sense—8 are from the East and Southeast, whereas, of the remaining 16—the narrowest noses—11 are from the West and Northwest.

Nasal index.—Table 16 shows that, although both of the absolute measurements of the nose tend to be largest in the East and Southeast and smallest in the West and Northwest, their ratios tend to be the opposite; i. e., relatively narrow noses are more common in the East and Southeast and relatively broad noses in the West and Northwest. Obviously this is due to the fact that the length differs more than the breadth in these two areas. As examples of the geographic segregation of the nasal index, all of the male records from Argentina and Tierra del Fuego based on adequate numbers, with one exception (No. 39), range from 46.1 to 47.4, whereas those from Perú range from 47.5 to 50.1. The exceptional group from Argentina appears to be similar to the Peruvians in both the absolute and relative dimensions of the nose. (Cf. also tables 14 and 15.) This might be expected from the intermediate geographic location of this group (map 1). The generalized distribution of the nasal index thus appears to be much like that for head size shown on map 3.

Summary.—The clearest fact that emerges from this review of skull measurements is the clear geographic segregation of head size: the largest heads in the East and Southeast and the smallest heads in the West and Northwest. The ratios between pairs of measurements do not show this regional difference so clearly, except the mean height index and the nasal index. However, the significance of these two indicial distributions may not be the same in both cases. In South America the mean height index ranges from about 75 to 89, and the nasal index from about 46 to 52. The different values of these two indices reflect the disproportions of the measures from which they are derived; in other words, nasal length is about twice the size of nasal breadth, whereas cranial height is much more nearly equal to the mean of cranial length and breadth. When two such measures are quite disproportionate, as in the case of the nose, their ratio changes more markedly with increase in general skull size. This fact probably accounts largely for the geographic changes in the nasal index paralleling those of the nasal diameters.

The peculiar geographic localization of low-headedness in the northern part of South America as determined by the mean height index thus may be significant of something more than a change in general head size, since the component measurements are more nearly of equal value. In this connection it is interesting that there seems to be a more or less continuous distribution of low-headedness from Siberia through western North America and Central America into northern South America (Stewart, 1943 d).

Each of the tables given here (tables 2–16) includes standard deviations (sigmas) of series of 25 or more specimens. For each measurement or index there thus results a mean sigma based upon a fair number of series. In general, as discussed elsewhere (Stewart, 1943 e), these mean sigmas indicate about the same amount of variability as in North American series, and somewhat less than that of European series.

TABLE 1.—*List of undeformed cranial series used in the present study and their sources*

Series No.	Locality or tribe	Author
1	Cerro de Luna, Venezuela	Marcano, 1893 b.
2	*Ipi-Iboto*, Venezuela	Marcano, 1893 b.
3	Curcurital, Venezuela	Marcano, 1893 b.
3a	*Piaro* (Venezuela)	Marcano, 1890 a.
4	Valleys of Aragua and Caracas, Venezuela.	Marcano, 1893 a.
5	*Cuica* and *Timote* (Venezuela)	Marcano, 1891.
6	*Goajiro* (Colombia-Venezuela)	Marcano, 1890 b; Virchow, 1886 b.
7	Near Bogotá, Colombia	Broca, 1876.
8	Paltacalo, Ecuador	Rivet, 1908.
9	Paraná, Delta, Argentina	Torres, L. M., 1911.
10	Río Negro, Argentina	Marelli, 1913 a.
11	Río Chubut, Argentina	Marelli, 1913 a.
12	Late *Araucanian* (Argentina)	Marelli, 1913 a; Ten Kate, 1892.
13	*Araucanian* (Chile)	Latcham, 1904 b.
14	Near Norquín, Argentina (*Araucanian* ?).	Virchow, 1894.
15	Near Lakes Colhue and Musters, Argentina.	Verneau and De la Vaulx, 1902.
16	Near Lake Buenos Aires, Argentina	Imbelloni, 1923 a.
17	*Ona* (Tierra del Fuego)	Gusinde, 1939; Hrdlička, *in* Dabbene, 1911.
18	*Yahgan* (Tierra del Fuego)	Gusinde, 1939; Hrdlička, *in* Dabbene, 1911; Hultkrantz, 1898; Ten Kate, 1904.
19	*Alacaluf* (Tierra del Fuego)	Gusinde, 1939; Hyades and Deniker, 1891; Mantegazza and Regalia, 1886; Mehnert, 1893; Ten Kate, 1904; Turner, 1884.
20	San Damian, Perú	Newman, 1943.
21	Chancay, Perú	Newman, 1943.
22	Chicama, Moche, and Virú Valleys, Perú.	Stewart, 1943 a.
23	Paucarcancha, etc., Perú	MacCurdy, 1923.
23a	Machu Picchu, Perú	Eaton, 1916.
23b	Region of Calca, Perú	Quevedo A., 1941–42.
24	Lagoa Santa, Brazil	Bastos d'Avila, Handbook, this vol., p. 74; Hansen, 1888; Pöch, 1938; Walter, Cathoud, and Mattos, 1937.

TABLE 1.—*List of undeformed cranial series used in the present study and their sources*—Continued

Series No.	Locality or tribe	Author
25	*Botocudo* (Brazil)	Canestrini and Moschen, 1879; Ehrenreich, 1887; Fridolin, 1898; Hansen, 1888; Lacerda and Peixoto, 1876 Rey, 1880; Rodrigues Peixoto, 1885; Sergi, G., 1891; Schaaffhausen, 1877, 1879–80; Spengel, 1874; Virchow, 1874 b; Wieger, 1884; Zimmerman, 1935.
26	Imbabura, Ecuador	Jijón y Caamaño, 1912.
27	Shell mounds, Brazil	Lacerda, 1885; Virchow, 1872 a, 1874 a.
28	Coquimbo Bay, Chile	Latcham, 1904 a.
29	*Arawak* (Guianas)	Broesike, 1880; Flower, W. H., 1907.
30	*Machushí* (Brazil)	Broesike, 1880; Flower, W. H., 1907.
31	*Ature* (Brazil)	Spengel, 1874.
32	*Motilón* (Colombia-Venezuela)	Ernst, 1887 c.
33	*Coroado* (Brazil)	Ecker, 1878; Hensel, 1870.
34	*Sirionó* (Bolivia)	Outes, 1924.
35	*Chiriguano* (Bolivia)	Del Campana, 1902.
36	*Mataco* (Argentina)	Lehmann-Nitsche, 1916 a; Otis, 1880.
37	*Guayaquí* (Paraguay)	Giuffrida-Ruggeri, 1906 b.
38	*Chono* (Chile)	Flower, W. H., 1907; Hultkranz, 1898.
39	Calchaquí Valley, Argentina	Constanzó, 1942 a.
39a	Calchaquí Valley, Argentina	Kunike, 1911 a.

TABLE 2.—*Cranial measurements (mm.) of South American series: Maximum length* [1]

Series No.	Country	Male				Female			
		No. spec.	Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
17	Tierra del Fuego	26	191.81±0.71	5. 38	183–202	10	184.4		166–202
19	Tierra del Fuego	12	189.8		182–198	12	180.7		173–186
10	Argentina	57	188.47±0.60	6. 68	176–201	45	178.56±0.55	5. 47	167–189
11	Argentina	26	187.19±0.53	3. 99	180–195	30	178.93±0.65	5. 25	167–188
9	Argentina	44	186.20±0.56	5. 53	176–196	20	178.1		166–185
18	Tierra del Fuego	39	186.02±0.59	5. 50	173–196	20	176.9		163–187
24	Brazil	9	185.2		178–196	8	179.9		172–192
3	Venezuela	14	185.1		168–193	26	174.35±0.70	5. 28	165–185
15	Argentina	9	185.0		172–192	1	180.0		
16	Argentina	3	183.7		180–187				
25	Brazil	31	182.87±0.69	5. 73	170–195	18	175.2		165–185
27	Brazil	10	182.8		170–200	4	167.5		162–172
2	Venezuela	22	182.6		174–196	25	172.84±0.58	4. 30	163–181
3a	Venezuela	4	182.2		179–186	6	178.0		172–185
8	Ecuador	11	182.0		175–186				
5	Venezuela	5	181.2		175–188	1	167.0		
12	Argentina	27	180.67±0.72	5. 56	171–189	45	171.07±0.72	7. 17	160–190
4	Venezuela	14	179.6		170–186	5	167.0		160–172
23	Perú	67	179.42±0.43	5. 19	165–190	36	169.50±0.56	5. 02	159–180
7	Colombia	2	179.0		176–182	1	182.0		
14	Argentina	17	178.5		171–189	7	169.6		156–176
28	Chile	4	178.5		176-181	1	167.0		
23b	Perú	32	178.45±0.80	6. 00	166–190	23	166.9		155–179
1	Venezuela	50	178.18±0.56	5. 82	162–189	31	171.39±0.83	6. 82	155–187
20	Perú	65	177.57±0.39	4. 62	167–188	60	169.63±0.37	4. 28	160–181
13	Chile	25	176.96±0.80	5. 94	168–193	6	171.7		159–180
6	Colombia-Venezuela	8	176.5		170–185	8	168.0		162–174
26	Ecuador	4	176.2		170–185	2	174.5		170–179
22	Perú	65	175.25±0.50	6. 01	162–192	58	168.02±0.43	4. 85	159–178
23a	Perú	9	174.4		165–183	35	163.69±0.61	5. 36	155–175
21	Perú	26	174.04±0.65	4. 91	164–185	19	162.6		
Mean sigma				[2] 5. 49				[3] 5. 38	

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[1] This and the following tables are arranged by the descending order of the means in the males.
[2] Number of series, 14; number of specimens, 580.
[3] Number of series, 10; number of specimens, 391.

TABLE 3.—*Cranial measurements (mm.) of South American series: Maximum breadth*

Series No.	Country	Male				Female			
		No. spec.	Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
16	Argentina	3	148.7	--------	144–151	--------	--------	--------	--------
12	Argentina	27	146.11±0.56	4. 16	135–153	45	144.13±0.42	4. 18	136–152
15	Argentina	9	146.0	--------	140–155	1	144.0	--------	--------
4	Venezuela	14	144.1	--------	132–151	5	143.4	--------	136–152
11	Argentina	25	143.28±0.86	6. 38	132–159	30	139.43±0.59	4. 77	129–147
3	Venezuela	14	143.2	--------	137–150	26	138.85±0.62	4. 72	130–150
14	Argentina	17	143.0	--------	136–156	7	138.7	--------	133–142
17	Tierra del Fuego	26	142.96±0.55	4. 16	132–157	10	138.3	--------	127–145
18	Tierra del Fuego	39	142.80±0.51	4. 69	135–156	20	136.1	--------	125–141
9	Argentina	45	142.71±0.45	4. 50	134–153	22	135.1	--------	124–145
6	Colombia-Venezuela	8	142.6	--------	140–146	8	136.2	--------	132–140
19	Tierra del Fuego	12	141.8	--------	136–148	12	139.4	--------	132–144
1	Venezuela	50	141.36±0.46	4. 81	131–151	31	138.00±0.55	4. 57	127–147
13	Chile	25	141.28±0.60	4. 45	133–150	6	141.0	--------	138–143
3a	Venezuela	4	141.0	--------	138–143	6	136.2	--------	129–143
2	Venezuela	22	141.0	--------	133–151	25	138.36±0.58	4. 32	129–151
21	Perú	26	139.85±0.80	6. 06	126–150	19	135.0	--------	--------
5	Venezuela	5	139.8	--------	133–145	1	132.0	--------	--------
20	Perú	67	139.72±0.34	4. 12	130–151	60	134.80±0.36	4. 18	126–144
22	Perú	65	139.34±0.46	5. 46	127–152	58	135.84±0.51	5. 76	122–148
10	Argentina	53	138.43±0.47	5. 08	130–153	43	132.77±0.41	3. 99	124–141
26	Ecuador	4	138.0	--------	134–140	2	136.5	--------	136–137
7	Colombia	2	138.0	--------	133–143	1	133.0	--------	--------
23a	Perú	10	137.4	--------	130–148	35	134.94±0.81	7. 07	124–153
25	Brazil	31	136.39±0.66	5. 45	125–151	18	132.7	--------	124–143
28	Chile	4	135.5	--------	129–141	1	128.0	--------	--------
23	Perú	66	135.45±0.38	4. 60	126–144	36	130.42±0.49	4. 37	119–139
27	Brazil	10	135.0	--------	126–146	4	133.5	--------	132–134
23b	Perú	32	132.60±0.60	4. 52	124–140	23	125.6	--------	116–133
24	Brazil	9	132.3	--------	123–140	8	127.0	--------	118–133
8	Ecuador	11	130.0	--------	127–134	--------	--------	--------	--------
Mean sigma				[1] 4. 89				[2] 4. 79	--------

[1] Number of series, 14; member of specimens, 577.
[2] Number of series, 10; number of specimens, 389.

TABLE 4.—*Cranial measurements (mm.) of South American series: Basion-bregma height*

Series No.	Country	Male				Female			
		No. spec.	Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
9	Argentina	33	146.91±0.57	4.88	136–158	17	139.3		128–145
10	Argentina	51	142.02±0.49	5.17	131–156	35	132.31±0.57	5.02	121–145
15	Argentina	9	141.0		135–146	1	136.0		
27	Brazil	8	140.0		134–146	3	133.7		130–139
11	Argentina	23	139.7		128–152	26	134.19±0.34	5.66	122–145
19	Tierra del Fuego	12	139.2		132–146	12	130.9		125–136
25	Brazil	32	139.16±0.66	5.57	126–148	17	131.6		124–140
28	Chile	4	138.8		134–143	1	119.0		
26	Ecuador	3	138.3		130–145	2	135.5		135–136
12	Argentina	27	138.04±0.59	4.52	129–147	45	133.47±0.48	4.79	124–143
14	Argentina	16	137.6		126–144	7	130.6		127–135
23	Perú	67	137.07±0.45	5.47	120–149	36	128.56±0.58	5.14	117–142
24	Brazil	7	136.3		128–140	7	131.1		126–137
13	Chile	25	136.24±0.58	4.34	129–145	6	133.2		129–136
23b	Perú	32	136.24±0.54	4.04	125–142	23	130.7		124–137
17	Tierra del Fuego	26	136.15±0.54	4.04	127–142	9	135.1		127–143
18	Tierra del Fuego	38	135.95±0.49	4.45	124–143	18	131.0		122–139
22	Perú	63	135.13±0.39	4.63	123–146	56	128.77±0.39	4.35	118–142
8	Ecuador	11	134.6		129–133				
7	Colombia	2	134.0		132–136	1	134.0		
5	Venezuela	5	133.4		128–138	1	129.0		
21	Perú	26	132.58±0.59	4.49	123–142	2	135.5		135–136
20	Perú	66	132.20±0.33	4.03	123–143	57	124.58±0.41	4.56	113–132
16	Argentina	2	131.5		131–132				
3a	Venezuela	4	131.0		125–138	6	126.2		122–130
3	Venezuela	14	131.0		122–138	26	125.31±0.66	4.99	114–133
4	Venezuela	12	130.7		122–140	4	125.0		122–128
6	Colombia-Venezuela	8	128.5		122–135				
23a	Perú	8	127.8		117–144	35	123.00±0.56	4.87	110–137
1	Venezuela	48	127.65±0.46	4.72	118–138	30	122.43±0.58	4.71	114–134
2	Venezuela	22	126.6		108–138	20	115.2		99–128
Mean sigma				[1] 4.64				[2] 4.90	

[1] Number of series, 13; number of specimens, 534.
[2] Number of series, 9; number of specimens, 346.

TABLE 5.—*Cranial indices of South American series: Cranial index*

Series No.	Country	Male				Female			
		No. spec.	Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
35	Bolivia	1	84. 1						
12	Argentina	27	81. 00±0. 48	3. 72	72. 6–88. 3	45	84. 48±0. 40	4. 00	73. 5–89. 6
16	Argentina	3	80. 9		80. 0–82. 0				
6	Colombia-Venezuela	8	80. 8		78. 3–84. 1	8	81. 1		77. 2–85. 2
21	Perú	26	80. 32±0. 60	4. 43	72. 0–87. 0	19	83. 1		
4	Venezuela	14	80. 2		76. 2–87. 3	5	85. 9		85. 5–90. 5
14	Argentina	17	80. 1		74. 3–87. 6	7	81. 9		76. 0–90. 4
13	Chile	25	79. 76±0. 40	2. 94	74. 0–86. 0	6	82. 0		78. 8–86. 7
22	Perú	65	79. 60±0. 37	4. 44	68. 2–90. 5	58	80. 90±0. 38	4. 32	70. 9–90. 7
1	Colombia-Venezuela	50	79. 37±0. 30	3. 19	72. 2–86. 5	31	80. 63±0. 36	2. 94	76. 5–89. 0
31	Brazil	1	79. 2						
32	Colombia-Venezuela	1	79. 0						
20	Perú	65	78. 87±0. 21	2. 51	73. 0–83. 8	60	79. 45±0. 22	2. 54	73. 5–88. 3
15	Argentina	9	78. 7		74. 3–86. 0	1	80. 0		
23a	Perú	9	78. 4		73. 0–88. 6	33	82. 52±0. 62	5. 32	75. 0–93. 8
26	Ecuador	4	78. 4		75. 7–81. 2	2	78. 2		76. 5–80. 0
3	Venezuela	14	77. 4		73. 8–82. 1	26	79. 99±0. 47	3. 55	74. 4–91. 3
3a	Venezuela	4	77. 4		75. 0–79. 9	6	76. 5		75. 0–78. 5
33	Brazil	2	77. 4		76. 4–78. 4	1	76. 3		
34	Bolivia	1	77. 3						
2	Colombia-Venezuela	22	77. 2		72. 0–81. 4	25	80. 15±0. 31	2. 33	75. 7–85. 3
5	Venezuela	5	77. 2		70. 7–81. 4	1	79. 0		
7	Colombia	2	77. 1		75. 6–78. 6	1	73. 1		
18	Tierra del Fuego	38	76. 64±0. 32	2. 98	71. 4–85. 4	20	77. 0		72. 3–81. 8
11	Argentina	25	76. 60±0. 48	3. 54	70. 2–85. 5	30	77. 97±0. 46	3. 70	72. 0–86. 2
9	Argentina	42	76. 56±0. 31	2. 99	70. 8–82. 6	19	76. 2		72. 1–82. 8
23b	Perú	32	76. 56±0. 38	3. 21	69. 9–81. 8	23	74. 9		68. 3–79. 5
30	Brazil	2	76. 3		72. 5–80. 1	1	78. 3		
28	Chile	4	75. 6		71. 6–79. 2	1	76. 6		
23	Perú	66	75. 50±0. 22	2. 71	69. 8–82. 0	36	76. 78±0. 31	2. 76	69. 7–82. 9
19	Tierra del Fuego	12	74. 7		72. 0–77. 5	12	77. 2		72. 7–80. 1
25	Brazil	31	74. 56±0. 35	2. 86	69. 1–81. 5	18	75. 8		71. 3–81. 2
17	Tierra del Fuego	25	74. 33±0. 35	2. 68	69. 3–79. 4	10	75. 2		69. 4–81. 7
27	Brazil	10	74. 0		67. 0–82. 0	4	80. 2		79. 8–81. 5
36	Argentina	2	74. 0		73. 3–74. 6	2	75. 4		75. 3–75. 4
10	Argentina	54	73. 67±0. 31	3. 38	66. 7–82. 5	44	74. 41±0. 33	3. 26	66. 3–83. 9
8	Ecuador	11	71. 4		69. 9–72. 6	4	70. 2		67. 4–72. 9
24	Brazil	9	71. 4		69. 1–74. 3	8	70. 8		67. 8–72. 7
38	Chile					4	81. 6		79. 2–83. 4
29	Guianas					4	80. 0		79. 5–83. 4
37	Paraguay					1	77. 0		
Mean sigma				[1] 3. 26				[2] 3. 47	

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[1] Number of series, 14; number of specimens, 571.
[2] Number of series, 10; number of specimens, 388.

TABLE 6.—*Cranial indices of South American series: Mean height index*

Series No.	Country	Male				Female			
		No. spec.	Mean±p.e.	Sigma	Range	No. spec.	Mean±p.e.	Sigma	Range
27	Brazil	8	89.1	-------	82.4–94.0	3	89.3	-------	87.4–92.0
9	Argentina	31	88.96±0.37	3.08	84.4–96.0	15	88.5	-------	85.1–90.9
28	Chile	4	88.4	-------	86.4–91.7	1	80.7	-------	----------
23b	Perú	32	87.6	-------	Cal.	23	89.3	-------	Cal.
26	Ecuador	3	87.4	-------	85.5–89.2	2	87.2	-------	86.1–88.2
35	Bolivia	1	87.4	-------	----------	-----	----------	-------	----------
25	Brazil	32	87.17±0.41	3.48	78.8–94.3	17	85.7	-------	80.2–88.7
23	Perú	66	87.16±0.26	3.02	80.1–93.4	36	85.89±0.36	3.20	79.5–91.5
10	Argentina	48	86.86±0.35	3.63	81.2–94.7	35	85.08−0.37	3.55	78.3–91.8
8	Ecuador	11	86.3	-------	Cal.	-----	----------	-------	----------
22	Perú	62	85.84±0.23	2.68	81.2–93.6	56	84.98±0.25	2.82	76.9–91.8
14	Argentina	16	85.8	-------	80.0–90.1	7	84.7	-------	82.7–86.8
33	Brazil	2	85.8	-------	83.6–87.9	1	87.9	-------	----------
13	Argentina	25	86.67±0.37	2.78	79.6–91.3	6	85.3	-------	79.4–88.9
24	Brazil	6	85.2	-------	79.5–88.7	7	85.7	-------	82.5–88.8
15	Argentina	9	85.2	-------	Cal.	1	84.0	-------	----------
11	Argentina	22	84.7	-------	77.3–91.9	24	84.2	-------	77.0–92.6
7	Colombia	2	84.6	-------	83.7–85.4	1	85.1	-------	----------
34	Bolivia	1	84.6	-------	----------	-----	----------	-------	----------
12	Argentina	27	84.51±0.37	2.82	78.4–89.0	45	84.68±0.30	2.98	79.3–91.2
32	Colombia-Venezuela	1	84.4	-------	----------	-----	----------	-------	----------
21	Perú	26	84.35±0.37	2.77	78.0–91.0	18	83.6	-------	----------
19	Tierra del Fuego	12	84.0	-------	79.3–88.2	12	81.8	-------	76.6–85.2
36	Argentina	2	83.7	-------	82.8–84.6	1	86.7	-------	----------
20	Perú	65	83.20±0.25	2.96	77.6–91.1	57	81.97±0.28	3.12	73.5–89.4
5	Venezuela	5	83.1	-------	78.3–85.7	1	86.3	-------	----------
18	Tierra del Fuego	38	82.69±0.28	2.52	77.7–87.8	18	83.7	-------	77.5–87.2
23a	Perú	8	82.6	-------	76.4–91.1	32	82.61±0.43	3.58	74.0–90.4
17	Tierra del Fuego	26	82.30±0.26	1.96	76.7–85.4	9	83.7	-------	80.1–87.5
3a	Venezuela	4	81.0	-------	77.6–84.4	6	80.4	-------	74.4–83.6
4	Venezuela	12	80.8	-------	73.4–90.6	4	80.0	-------	77.7–83.1
6	Colombia-Venezuela	8	80.5	-------	76.0–82.4	8	79.1	-------	73.5–82.7
1	Colombia-Venezuela	48	79.99±0.29	3.00	72.9–86.2	30	79.12±0.40	3.30	73.3–87.3
16	Argentina	2	79.8	-------	78.2–81.5	-----	----------	-------	----------
30	Brazil	2	79.8	-------	78.1–81.6	1	76.9	-------	----------
3	Venezuela	14	79.8	-------	74.4–83.0	26	80.07±0.44	3.31	74.3–88.9
2	Colombia-Venezuela	22	78.3	-------	65.4–85.6	20	74.5	-------	63.5–91.3
31	Brazil	1	75.9	-------	----------	-----	----------	-------	----------
38	Chile	-----	----------	-------	----------	4	86.0	-------	84.0–88.1
37	Paraguay	-----	----------	-------	----------	1	83.2	-------	----------
29	Guianas	-----	----------	-------	----------	4	79.4	-------	76.4–81.2
Mean sigma				[1] 2.89				[2] 3.23	----------

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[1] Number of series, 12; number of specimens, 494.

[2] Number of series, 8; number of specimens, 317.

Table 7.—*Cranial measurements (cc.) of South American series: Cranial capacity*

Series No.	Country	Male				Female			
		No. spec.	Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
16	Argentina	3	1585.0	--------	1510–1650	1	1490.0	--------	----------
15	Argentina	9	1561.0	--------	1415–1695	1	1475.0	--------	----------
11	Argentina	41	1531.58±13.28	127.28	1300–1765	29	1359.68±16.04	128.25	1185–1575
9	Argentina	45	1529.72±10.03	99.68	1345–1720	19	1343.2	--------	1200–1500
19	Tierra del Fuego.	11	1490.0	--------	1248–1710	10	1304.6	--------	1170–1400
3	Venezuela	14	1488.7	--------	1240–1655	26	1328.85±15.59	117.85	1145–1580
4	Venezuela	10	1473.0	--------	1230–1595	3	1278.3	--------	1250–1295
39	Argentina	70	1466.14±10.40	129.03	1155–1770	30	1339.00±11.36	92.26	1165–1541
10	Argentina	76	1452.10±9.48	122.58	1295–1835	51	1356.56±10.57	111.90	1175–1515
23b	Perú	31	1445.00±14.23	105.50	1180–1675	21	1209.0	--------	1015–1355
18	Tierra del Fuego.	33	1435.74±13.37	113.90	1200–1700	19	1289.6	--------	1160–1495
25	Brazil	32	1431.81±13.58	113.92	1230–1684	16	1266.6	--------	1130–1460
5	Venezuela	3	1426.7	--------	1300–1495	-----	----------	--------	----------
17	Tierra del Fuego.	22	1426.2	--------	1260–1735	8	1355.6	--------	1040–1550
12	Argentina	37	1426.00±11.28	101.70	----------	52	1310.00±10.65	113.90	----------
8	Ecuador	7	1425.0	--------	1270–1565	-----	----------	--------	----------
39a	Argentina	72	1417.06±11.35	142.85	1115–1710	44	1247.86±11.44	112.45	1010–1500
13	Chile	23	1411.0	--------	1250–1550	6	1361.0	--------	1100–1490
1	Venezuela	46	1409.78±10.14	102.05	1155–1625	29	1276.30±16.12	128.75	1090–1575
3a	Venezuela	3	1403.0	--------	1304–1470	6	1361.8	--------	1236–1525
7	Colombia	2	1395.0	--------	1295–1495	1	1465.0	--------	----------
14	Argentina	14	1386.3	--------	1298–1491	6	1253.3	--------	1100–1422
2	Venezuela	21	1375.6	--------	1190–1610	21	1268.4	--------	1190–1400
23	Perú	108	1371.92±6.95	107.15	1110–1670	81	1205.40±5.92	79.05	1020–1450
6	Colombia-Venezuela.	8	1371.2	--------	1285–1490	8	1153.5	--------	1040–1302
23a	Perú	7	1356.6	--------	1218–1498	31	1188.50±12.88	106.35	922–1370
Mean sigma				[1] 115.06				[2] 110.08	----------

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[1] Number of series, 11; number of specimens, 591.
[2] Number of series, 9; number of specimens, 373.

Table 8.—*Cranial measurements (mm.) of South American series: Upper face height*

Series No.	Country	Male				Female			
		No. spec.	Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
16	Argentina	5	77.6	-------	73–82	2	76.0	-------	75–77
9	Argentina	18	76.7	-------	65–82	9	70.8	-------	62–79
11	Argentina	55	75.89±0.34	3.69	69–86	42	72.85±0.41	3.96	64–80
17	Tierra del Fuego	27	75.89±0.49	3.78	66–81	10	74.5	-------	66–85
10	Argentina	94	74.46±0.33	4.79	66–85	58	69.58±0.31	3.48	60–75
6	Colombia-Venezuela	4	74.0	-------	72–76	4	63.8	-------	57–67
18	Tierra del Fuego	37	73.41±0.42	3.77	63–83	19	67.2	-------	57–78
25	Brazil	12	72.2	-------	64–79	7	66.7	-------	60–80
19	Tierra del Fuego	10	72.0	-------	64–80	9	68.1	-------	62–73
20	Perú	46	71.98±0.37	3.76	63–78	44	65.20±0.26	2.53	59–70
21	Perú	56	71.64±0.31	3.73	60–80	26	66.08±0.37	2.81	--------
23b	Perú	32	69.12±0.47	3.52	60–73	23	62.4	-------	54–70
8	Ecuador	11	68.0	-----	64–72	-----	----------	-------	--------
23	Perú	100	67.81±0.28	4.13	56–80	55	63.11±0.33	3.58	55–71
22	Perú	57	67.53±0.26	2.88	62–75	50	65.12±0.38	3.94	57–75
28	Chile	4	67.5	-------	64–72	1	63.0	-------	--------
23a	Perú	8	66.5	-------	62–80	28	64.07±0.37	2.88	59–70
26	Ecuador	5	66.4	-------	61–72	2	67.5	-------	65–70
Mean sigma				[1] 3.78				[2] 3.31	--------

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[1] Number of series, 9; number of specimens, 504.
[2] Number of series, 7; number of specimens, 303.

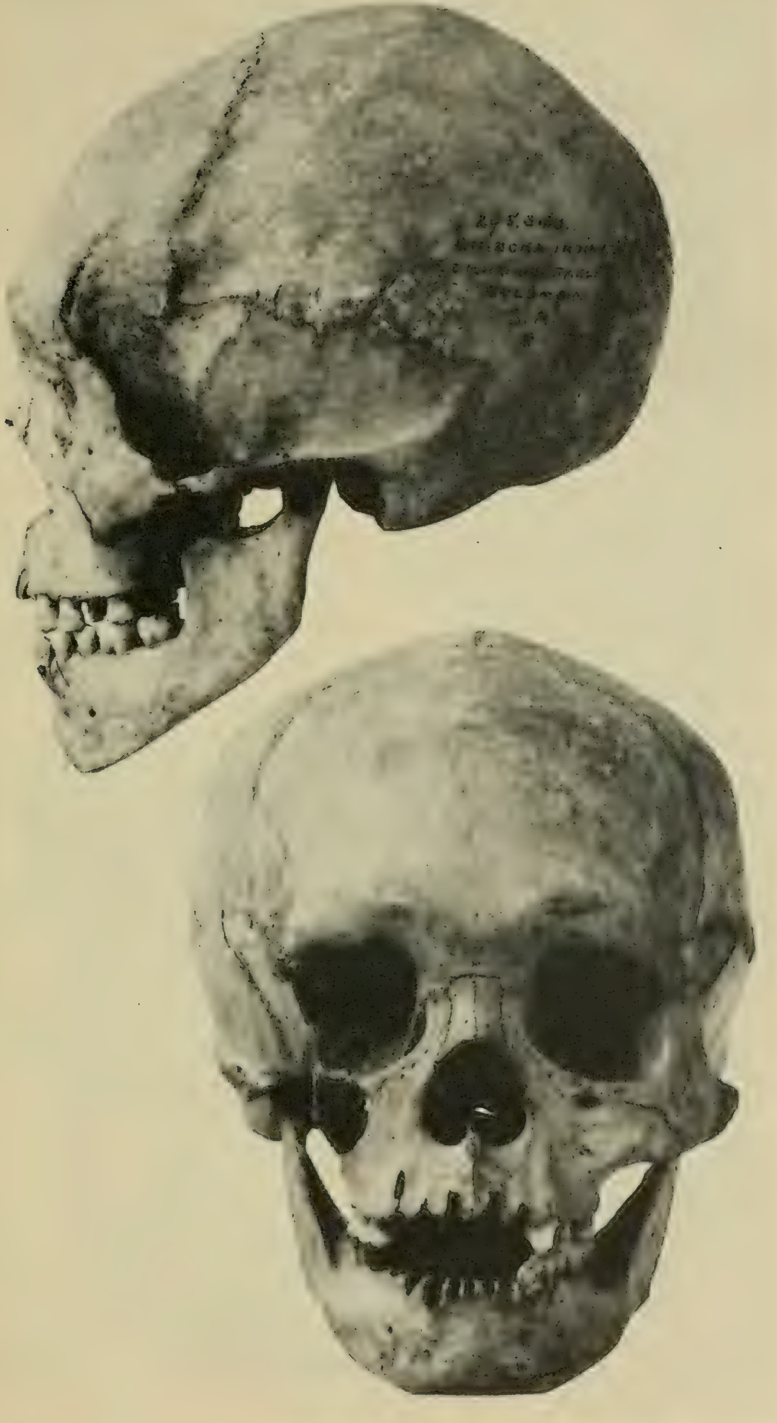

Plate 5.—Skull from Cerro Tablayo, Colombia (lateralis and frontalis). Compare the small features with those of skull shown in plate 6, and note the low vault. Mean height index is 73.6. (Courtesy United States National Museum, skull No. 298,343.)

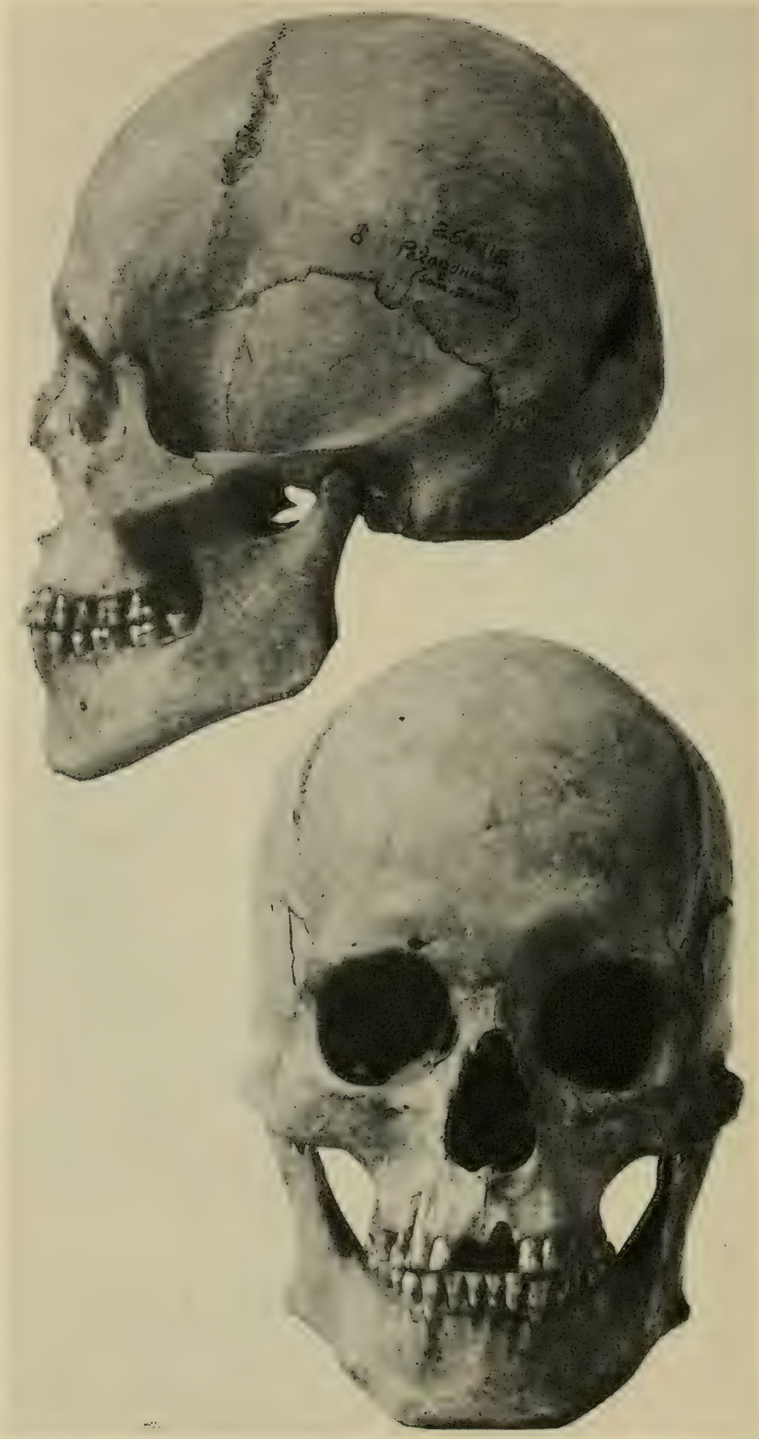

Plate 6.—Skull from Patagonia, Argentina (lateralis and frontalis). Compare size of features with those of skull shown in plate 1, and note very high head. Mean height index is 93.8. (Courtesy United States National Museum, skull No. 264,112.)

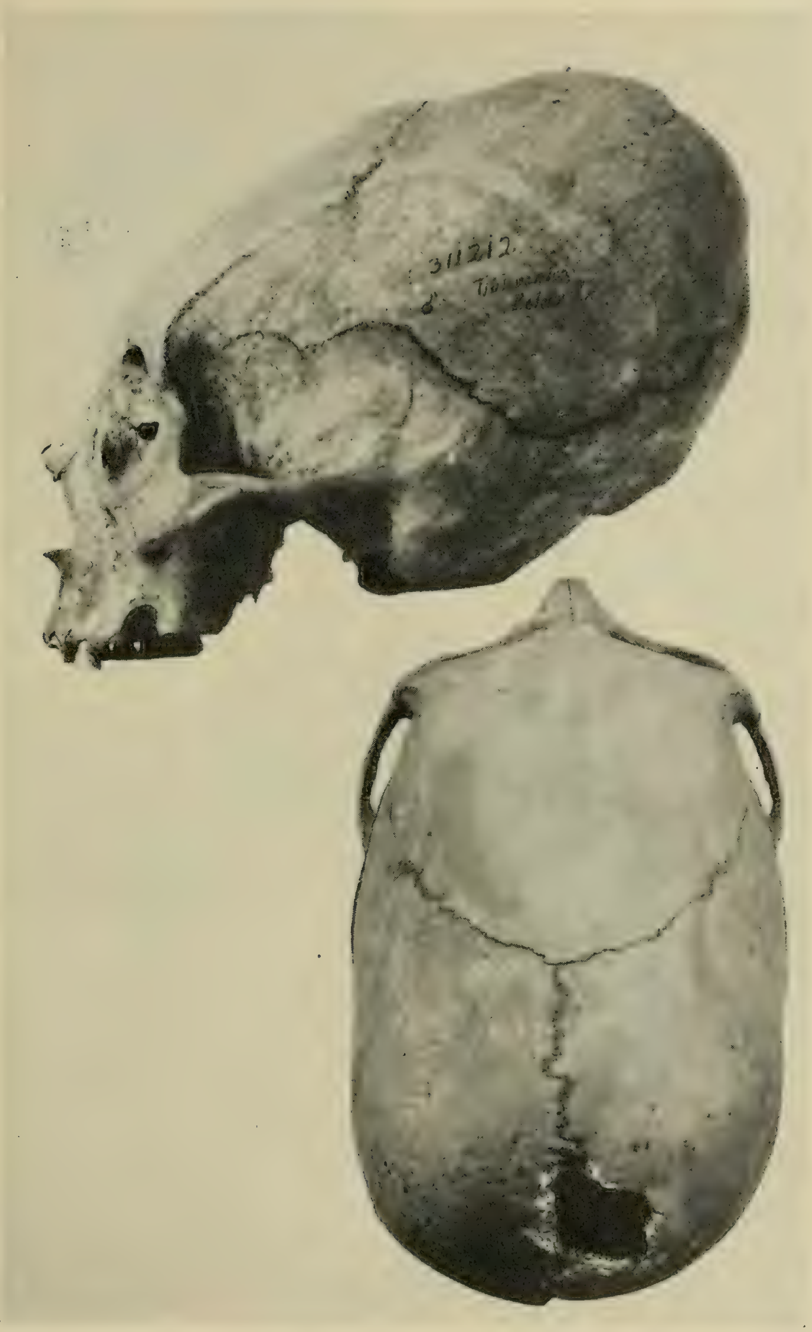

PLATE 7.—Skull from Tiahuanaco, Bolivia (lateralis and verticalis). Circular type of artificial deformity, symmetrical and elongated. (Courtesy United States National Museum, skull No. 311,212.)

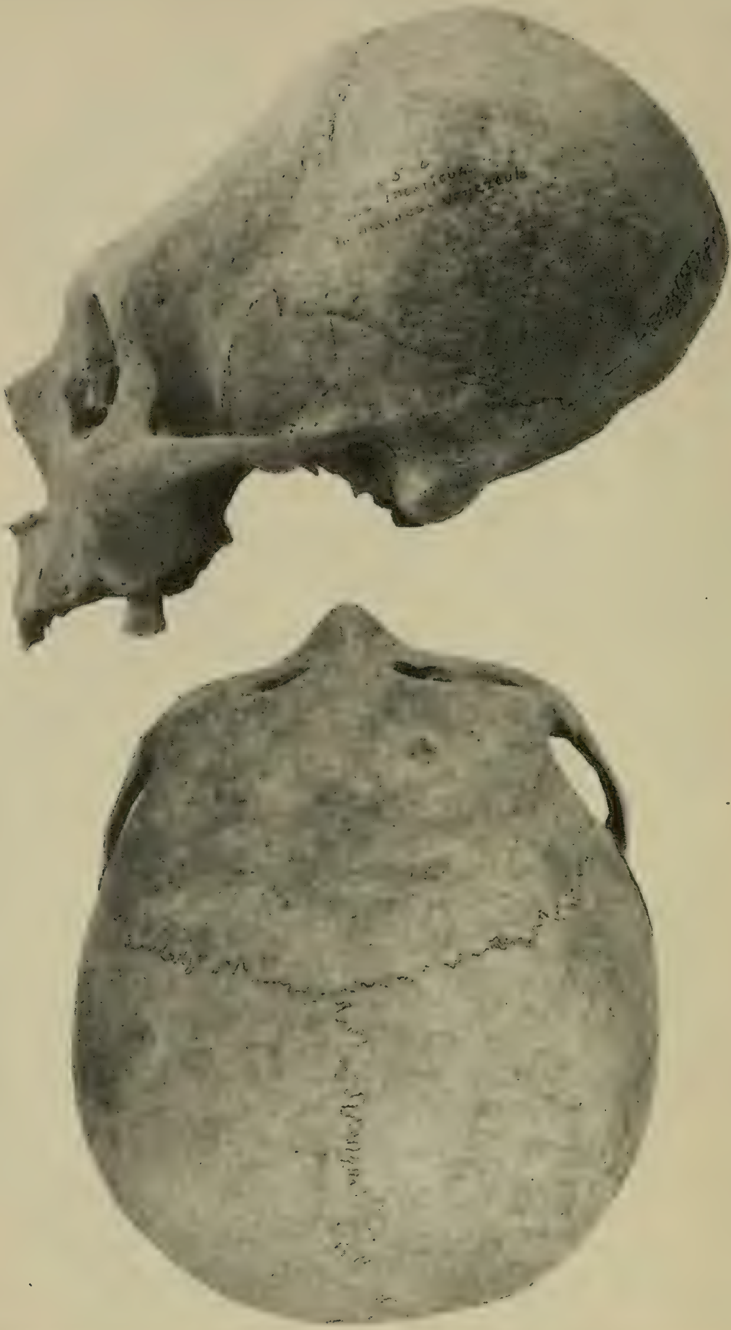

Plate 8.—Skull from Lake Tacarigua, near Maracay, Venezuela (lateralis and verticalis). Extreme frontal flattening. Note symmetry and roundness in the vertical view. (Courtesy United States National Museum, skull No. 378,586.)

TABLE 9.—*Cranial measurements (mm.) of South American series: Maximum face breadth*

Series No.	Country	Male				Female			
		No. spec.	Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
11	Argentina	32	148. 47±0. 69	5. 82	132–158	26	136. 85±0. 51	4. 02	126–144
15	Argentina	9	147. 0		140–152	1	140. 0		
16	Argentina	3	146. 7		144–151				
9	Argentina	11	144. 6		140–150	9	132. 2		123–138
17	Tierra del Fuego	26	143. 69±0. 58	4. 36	135–151	9	137. 1		123–148
12	Argentina	45	143. 13±0. 48	4. 82	131–151	39	135. 08±0. 49	4. 55	121–141
18	Tierra del Fuego	37	142. 38±0. 51	4. 64	131–152	18	131. 2		113–140
19	Tierra del Fuego	12	141. 9		130–151	12	132. 6		122–141
27	Brazil	4	139. 5		134–146	3	128. 7		128–130
10	Argentina	32	138. 91±0. 69	5. 81	127–153	20	127. 8		116–135
23b	Perú	32	138. 72±0. 67	5. 04	120–145	23	126. 4		119–132
25	Brazil	31	137. 35±0. 69	5. 72	122–147	13	125. 8		112–140
6	Colombia–Venezuela	8	137. 0		130–142	8	125. 9		121–132
8	Ecuador	6	136. 6		131–144				
7	Colombia	2	136. 5		135–138	1	134. 0		
13	Chile	25	136. 28±0. 48	3. 53	131–143	6	127. 6		122–130
4	Venezuela	11	136. 0		127–149	5	131. 4		125–139
5	Venezuela	2	136. 0		131–141				
20	Perú	49	135. 69±0. 44	4. 53	124–145	53	124. 94±0. 37	4. 02	117–136
21	Perú	27	135. 56±0. 67	5. 17	123–147	3	128. 7		128–130
14	Argentina	10	135. 5		128–142	3	130. 0		125–134
22	Perú	55	135. 49±0. 44	4. 79	124–145	50	127. 30±0. 38	3. 97	117–136
3	Venezuela	14	134. 8		128–144	25	124. 65±0. 64	4. 76	116–134
1	Colombia–Venezuela	43	134. 58±0. 43	4. 20	126–143	27	125. 15±0. 62	4. 77	116–137
23	Perú	91	133. 93±0. 42	5. 89	120–146	58	123. 03±0. 35	3. 95	115–130
3a	Venezeula	4	132. 5		125–139	6	125. 5		118–133
2	Colombia–Venezeula	18	132. 1		127–142	14	122. 1		117–127
23a	Perú	8	131. 5		125–139	24	124. 3		117–135
26	Ecuador	4	130. 8		126–137	2	132. 0		131–133
28	Chile	4	128. 8		126–132	1	129. 0		
Mean sigma				[1] 4. 95				[2] 4. 29	

[1] Number of series, 13; number of specimens, 525.
[2] Number of series, 7; number of specimens, 278.

TABLE 10.—*Cranial measurements (mm.) of South American series: Upper face index*

Series No.	Country	Male				Female			
		No. spec.	Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
9	Argentina	6	55. 0		53. 4–57. 1	4	54. 7		51. 4–59. 8
10	Argentina	28	54. 18±0. 41	3. 22	48. 3–60. 9	20	53. 1		49. 2–59. 5
6	Colombia-Venezuela	4	53. 4		50. 7–55. 6	4	50. 0		46. 0–53. 6
28	Chile		53. 3		48. 4–55. 8	1	48. 8		
20	Perú	43	53. 07±0. 31	2. 98	46. 1–62. 1	39	52. 44±0. 24	2. 18	48. 5–56. 8
17	Tierra del Fuego	26	52. 68±0. 40	2. 99	45. 9–59. 3	9	55. 0		51. 8–58. 6
16	Argentina	3	52. 6		50. 9–55. 8				
21	Perú	23	52. 5		48. 0–57. 0	23	51. 0		
25	Brazil	11	52. 2		45. 4–56. 4	5	53. 4		48. 4–57. 1
18	Tierra del Fuego	37	51. 63±0. 33	2. 98	45. 0–56. 8	18	50. 8		45. 4–56. 1
11	Argentina	35	51. 00±0. 30	2. 63	46. 0–57. 0	25	52. 76±0. 41	3. 03	48. 0–58. 0
19	Tierra del Fuego	10	50. 8		46. 2–53. 8	9	51. 5		47. 8–54. 1
23	Perú	84	50. 74±0. 23	3. 08	43. 7–59. 5	52	51. 15±0. 18	1. 97	47. 5–56. 3
23a	Perú	7	50. 7		48. 9–52. 6	14	52. 4		47. 6–61. 2
22	Perú	47	48. 82±0. 24	2. 46	44. 8–55. 0	42	50. 86±0. 32	3. 06	43. 9–58. 6
26	Ecuador	4	49. 7		47. 3–51. 8	2	51. 2		48. 9–53. 4
23b	Perú	32	49. 48±0. 39	3. 28	42. 1–54. 9	23	49. 6		45. 9–54. 4
8	Ecuador	6	49. 1		44. 6–54. 2	2	54. 0		52. 0–56. 0
Mean sigma				[1] 2. 95				[2] 2. 56	

[1] Number of series, 8; number of specimens, 332.
[2] Number of series, 4; number of specimens, 158.

TABLE 11.—*Cranial measurements (mm.) of South American series: Orbital height*

Series No.	Country	No. spec.	Male			Female			
			Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
4	Venezuela	16	38.0	-------	35–41	5	37.0	-------	35–38
3	Venezuela	11	36.9	-------	34–40	27	34.56±0.27	2.09	31–40
23b	Perú	32	36.48±0.25	1.88	32–41	23	34.9	-------	30–39
9	Argentina	31	36.42±0.34	2.81	30–42	16	35.4	-------	32–40
19	Tierra del Fuego	12	36.1	-------	34–40	12	34.8	-------	33–37
15	Argentina	9	36.0	-------	33–39	1	35.5	-------	--------
10	Argentina	105	35.95±0.13	1.91	32–40	59	34.77±0.16	1.82	31–38
11	Argentina	55	35.81±0.18	2.01	31. 40	45	34.64±0.20	2.06	31–39
39	Argentina	122	35.69±0.12	1.94	31–40	41	35.83±0.21	1.99	30–39
13	Chile	25	35.68±0.22	1.67	33–39	6	35.0	-------	34–36
6	Colombia-Venezuela	8	35.6	-------	32–38	8	33.8	-------	30–37
2	Colombia-Venezuela	22	35.5	-------	32–40	21	34.4	-------	31–40
18	Tierra del Fuego	39	35.44±0.23	2.12	32–40	19	34.4	-------	32–38
26	Ecuador	5	35.4	-------	31–42	2	39.0	-------	38–40
17	Tierra del Fuego	27	35.33±0.23	1.80	32–39	10	34.3	-------	32–37
39a	Argentina	117	35.32±0.13	2.01	30–40	68	34.88±0.14	1.71	31–41
14	Argentina	16	35.1	-------	32–39	7	34.3	-------	32–37
5	Venezuela	5	35.0	-------	32–38	1	32.0	-------	--------
28	Chile	4	35.0	-------	35–35	1	31.0	-------	--------
23	Perú	107	34.92±0.10	1.49	29–40	77	34.19±0.14	1.78	30–41
8	Ecuador	11	34.6	-------	32–38	-----	--------------	-------	--------
16	Argentina	5	34.6	-------	32–38	2	37.5	-------	37–38
27	Brazil	5	34.6	-------	32–37	4	33.5	-------	29–39
1	Colombia-Venezuela	47	34.55±0.18	1.88	30–38	27	33.70±0. 18	1.38	31–37
21	Perú	82	34.34±0.13	1.77	30–38	31	34.13±0.18	1.52	--------
20	Perú	61	34.20±0.12	1.54	31–37	57	33.05±0.16	1.81	28–37
25	Brazil	26	34.12±0.26	1.95	31–40	14	33.6	-------	31–37
23a	Perú	9	33.9	-------	31–40	32	34.09±0.24	1.99	30–38
3a	Venezuela	4	33.8	-------	31–38	6	34.0	-------	32–35
22	Perú	58	33.53±0.15	1.65	30–37	51	33.82±0.15	1.56	29–37
24	Brazil	7	33.1	-------	29–35	5	32.4	-------	28–36
Mean sigma				[1] 1.90	-------------------------			[2] 1.79	--------

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[1] Number of series, 15; number of specimens, 934.

[2] Number of series, 11; number of specimens, 515.

TABLE 12.—*Cranial measurements (mm.) of South American series: Orbital breadth*

Series No.	Country	Male				Female			
		No. spec.	Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
13	Chile	25	42.16±0.20	1.52	39–45	6	39.5	--------	37–41
19	Tierra del Fuego	8	41.5	--------	39–44	8	39.6	--------	37–42
14	Argentina	16	41.3	--------	37–44	7	39.4	--------	36–42
25	Brazil	26	40.92±0.22	1.66	37–44	14	39.6	--------	36–45
9	Argentina	30	40.57±0.25	2.06	36–46	15	38.7	--------	35–43
3	Venezuela	11	40.4	--------	37–43	27	37,74±0.13	1.78	34–42
23b	Perú	32	40.24±0.47	1.44	37–43	23	37.8	--------	33–42
8	Ecuador	11	40.2	--------	38–42	------	--------	--------	--------
18	Tierra del Fuego	31	40.03±0.20	1.49	38–44	18	38.4	--------	36–42
15	Argentina	9	40.0	--------	37–43	1	40.0	--------	--------
28	Chile	4	40.0	--------	40–40	1	37.0	--------	--------
10	Argentina	105	39.52±0.13	1.93	36–45	59	37.93±0.20	2.31	33–41
21	Perú	81	39.51±0.13	1.73	35–44	31	37.90±0.19	1.55	--------
22	Perú	59	39.08±0.15	1.70	34–42	52	38.64±0.12	1.28	35–43
26	Ecuador	5	39.0	--------	38–40	2	39.0	--------	38–40
39	Argentina	122	38.97±0.15	2.52	28–46	41	38.51±0.21	1.99	32–42
5	Venezuela	5	38.9	--------	36–41	1	37.0	--------	--------
6	Colombia-Venezuela	8	38.9	--------	36–42	8	37.8	--------	34–40
4	Venezuela	16	38.8	--------	36–42	5	37.6	--------	37–39
2	Colombia-Venezuela	22	38.6	--------	36–43	21	36.8	--------	34–40
16	Argentina	5	38.6	--------	37–40	2	41.0	--------	40–42
11	Argentina	43	38.46±0.14	1.38	37–43	55	39.60±0.17	1.53	31–41
39a	Argentina	116	38.37±0.10	1.58	36–42	69	37.10±0.17	2.13	28–41
20	Perú	63	38.17±0.12	1.37	34–42	58	36.50±0.16	1.36	34–39
1	Colombia-Venezuela	47	38.15±0.15	1.49	35–41	27	37.22±0.19	1.47	35–40
23a	Perú	8	37.1	--------	35–40	31	35.55±0.16	1.32	33–38
3a	Venezuela	4	37.0	--------	35–39	6	36.2	-----	35–38
23	Perú	108	36.83±0.10	1.61	33–41	77	35.09±0.12	1.52	32–40
27	Brazil	6	36.8	--------	35–38	4	36.0	--------	35–38
Mean sigma				[1] 1.68				[2] 1.66	--------

[1] Number of series, 14; number of specimens, 888.
[2] Number of series, 11; number of specimens, 527.

TABLE 13.—*Cranial indices of South American series: Orbital index*

Series No.	Country	Male				Female			
		No. spec.	Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
4	Venezuela	16	98.1		90.2–102.5	5	98.4		92.1–102.7
23	Perú	106	95.07±0.34	5.14	79.3–108.6	75	97.53±0.41	5.22	85.7–115.1
27	Brazil	5	94.6		84.2–100.0	4	93.3		80.6–111.4
39a	Argentina	116	91.94±0.36	5.83	77.5–108.3	41	92.75±0.70	6.68	76.1–112.5
2	Colombia-Venezuela.	22	91.8		85.7–100.0	21	93.1		83.8–100.0
16	Argentina	5	91.8		85.0–100.0	2	91.3		87.6– 95.0
39	Argentina	122	91.74±0.45	7.34	76.0–125.0	68	93.77±0.51	6.19	77.5–125.0
23b	Perú	32	91.68±0.62	5.17	75.0–105.3	23	95.0		80.0– 97.5
10	Argentina	103	91.64±0.42	6.39	65.8–108.3	60	91.06±0.45	5.17	79.5–100.0
6	Colombia-Venezuela.	8	91.6		88.8– 97.3	8	89.4		83.3– 94.4
3	Venezuela	11	91.3		83.7– 95.1	27	91.62±0.57	4.36	82.0–102.6
23a	Perú	10	91.3		84.9–105.7	36	95.53±0.63	5.62	85.8–109.5
3a	Venezuela	4	91.2		86.1– 97.4	6	94.0		94.1– 97.1
26	Ecuador	5	90.7		77.5–105.0	2	100.0		100.0–100.0
11	Argentina	56	90.58±0.40	4.45	79.1–100.0	45	92.11±0.60	6.03	81.6–109.7
9	Argentina	29	90.50±0.96	7.64	75.0–105.3	14	92.3		80.5–105.3
1	Colombia-Venezuela.	47	90.48±0.48	4.88	81.1–102.7	27	90.58±0.45	3.50	84.2– 97.2
5	Venezuela	5	90.0		85.3– 95.0	1	86.5		
20	Perú	60	89.43±0.34	3.94	81.0– 97.4	58	90.62±0.42	4.78	73.7–100.0
12	Argentina	52	89.23±0.52	5.62	75.0–102.5	60	94.17±0.34	3.96	83.8–105.3
15	Argentina	9	88.9		84.6– 97.5	1	88.8		
21	Perú	81	88.18±0.44	5.50	77.0–109.0	31	90.00±0.51	4.19	
19	Tierra del Fuego	8	87.6		81.4– 93.8	8	88.6		82.9– 97.4
18	Tierra del Fuego	31	87.52±0.63	4.63	75.9– 95.2	18	89.1		80.7– 98.7
28	Chile	4	87.5		87.5– 87.5	1	83.8		
8	Ecuador	10	86.1		79.6– 91.5	3	89.6		89.1– 90.2
22	Perú	64	86.00±0.36	4.21	79.0–101.8	53	87.68±0.35	3.74	83.8–100.0
13	Chile	25	85.12±0.60	4.48	77.4– 93.0	6	86.3		82.9– 92.1
14	Argentina	16	85.0		76.1– 97.3	7	87.0		82.0– 94.4
25	Brazil	26	83.49±0.56	4.22	75.6– 93.0	14	84.9		80.0– 97.2
Mean sigma				[1] 5.30				[2] 4.95	

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[1] Number of series, 15; number of specimens, 950.
[2] Number of series, 12; number of specimens, 581.

Table 14.—*Cranial measurements (mm.) of South American series: Nasal height*

Series No.	Country	Male				Female			
		No. spec.	Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
9	Argentina	29	55.76±0.46	3.65	48-64	16	53.0	-------	48-64
3	Venezuela	14	54.4	-------	51-59	27	50.18±0.40	3.09	42-55
27	Brazil	5	54.2	-------	50-57	4	48.8	-------	44-54
11	Argentina	55	54.07±0.27	3.05	46-61	44	51.70±0.27	2.66	45-57
15	Argentina	9	54.0	-------	50-60	1	54.0	-------	--------
17	Tierra del Fuego	26	53.77±0.40	3.05	46-60	10	52.1	-------	45-60
10	Argentina	90	53.66±0.23	3.05	47-60	59	49.32±0.26	3.00	40-54
23b	Perú	31	53.12±0.23	1.76	45-54	23	48.4	-------	43-58
4	Venezuela	13	53.0	-------	49-57	5	50.0	-------	47-53
14	Argentina	16	52.8	-------	48-59	7	46.9	-------	41-51
16	Argentina	5	52.8	-------	49-58	2	52.0	-------	52-52
18	Tierra del Fuego	38	52.74±0.33	3.02	46-62	19	49.7	-------	44-55
25	Brazil	30	52.40±0.34	2.75	45-58	15	48.9	-------	44-56
19	Tierra del Fuego	12	52.2	-------	53-56	11	49.3	-------	46-53
13	Chile	25	52.12±0.35	2.58	46-57	6	50.3	-------	46-55
2	Colombia-Venezuela	22	51.9	-------	44-56	17	48.3	-------	44-51
1	Colombia-Venezuela	44	51.89±0.24	2.35	46-58	25	48.20±0.42	3.15	44-55
3a	Venezuela	4	51.8	-------	48-55	6	50.0	-------	47-53
6	Colombia-Venezuela	8	51.6	-------	46-55	8	48.4	-------	44-53
21	Perú	82	50.75±0.18	2.36	46-57	31	47.16±0.27	2.26	--------
26	Ecuador	5	50.6	-------	46-53	2	46.0	-------	45-47
5	Venezuela	5	50.4	-------	47-53	-----	----------	-------	--------
20	Perú	66	50.29±0.23	2.78	44-56	56	46.50±0.20	2.19	41-51
24	Brazil	6	50.2	-------	43-57	4	45.5	-------	44-46
39	Argentina	119	49.66±0.23	3.71	40-63	39	48.26±0.27	2.50	43-52
8	Ecuador	11	49.6	-------	46-54	-----	----------	-------	--------
28	Chile	4	49.0	-------	46-51	1	47.0	-------	--------
23	Perú	112	48.99±0.19	3.03	42-57	74	45.72±0.22	2.74	39-52
22	Perú	65	48.60±0.19	2.31	44-53	54	46.63±0.24	2.59	42-53
23a	Perú	8	47.5	-------	43-54	37	46.24±0.28	2.56	42-51
7	Colombia	2	46.0	-------	46-46	1	48.0	-------	--------
Mean sigma				[1] 2.82	----------			[2] 2.67	--------

[1] Number of series, 14; number of specimens, 812.

[2] Number of series, 10; number of specimens, 446.

TABLE 15.—*Cranial measurements (mm.) of South American series: Nasal breadth*

Series No.	Country	No. spec.	Male			Female			
			Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
23b	Perú	32	27. 24±0. 32	2. 40	20–29	23	24. 3	-------	22–26
15	Argentina	9	27. 0	-------	26–29	1	26. 0	-------	-------
2	Colombia-Venezuela	22	26. 8	-------	24–30	17	24. 9	-------	22–28
3	Venezuela	14	26. 5	-------	24–30	27	24. 41±0. 24	1. 87	20–28
3a	Venezuela	4	26. 2	-------	25–30	6	24. 3	-------	23–26
9	Argentina	28	26. 07±0. 24	1. 87	22–30	15	25. 4	-------	23–30
1	Colombia-Venezuela	44	25. 64±0. 17	1. 72	22–31	24	25. 7	-------	23–30
8	Ecuador	10	25. 6	-------	22–31	-----	-------	-------	-------
16	Argentina	5	25. 6	-------	24–29	2	23. 5	-------	23–24
11	Argentina	55	25. 56±0. 15	1. 73	22–29	45	24. 84±0. 16	1. 66	20–29
13	Chile	25	25. 24±0. 15	1. 10	24–28	6	24. 5	-------	23–26
10	Argentina	88	25. 05±0. 14	1. 73	20–30	58	24. 18±0. 16	1. 79	20–28
14	Argentina	16	25. 0	-------	22–27	6	24. 7	-------	22–27
19	Tierra del Fuego	12	24. 9	-------	22–28	12	24. 1	-------	21–28
25	Brazil	30	24. 87±0. 22	1. 75	22–29	15	22. 9	-------	18–28
26	Ecuador	5	24. 8	-------	20–27	2	26. 5	-------	26–27
17	Tierra del Fuego	26	24. 77±0. 25	1. 87	20–29	10	24. 5	-------	22–27
4	Venezuela	13	24. 7	-------	21–28	5	24. 4	-------	22–28
18	Tierra del Fuego	39	24. 59±0. 15	1. 37	22–28	19	23. 4	-------	20–27
39	Argentina	117	24. 57±0. 12	1. 95	20–29	38	24. 48±0. 21	1. 92	20–28
22	Perú	63	24. 27±0. 14	1. 67	21–28	53	23. 60±0. 16	1. 68	20–28
23	Perú	112	24. 25±0. 10	1. 65	20–29	72	23. 46±0. 16	1. 99	18–28
24	Brazil	5	24. 2	-------	23–25	5	22. 4	-------	21–24
6	Colombia-Venezuela	8	24. 1	-------	22–28	8	24. 0	-------	22–27
21	Perú	82	24. 04±0. 13	1. 71	21–28	30	23. 67±0. 19	1. 56	-------
20	Perú	58	24. 02±0. 16	1. 77	19–30	56	23. 09±0. 14	1. 57	20–27
28	Chile	4	23. 8	-------	20–26	1	22. 0	-------	-------
23a	Perú	8	23. 5	-------	22–25	37	23. 35±0. 20	1. 82	20–28
7	Colombia	2	23. 5	-------	23–24	1	25. 0	-------	-------
5	Venezuela	4	23. 2	-------	22–25	-----	-------	-------	-------
27	Brazil	6	23. 0	-------	21–25	3	22. 7	-------	22–23
Mean sigma				[1] 1. 74				[2] 1. 76	-------

[1] Number of series, 14; number of specimens, 799.
[2] Number of series, 9; number of specimens, 416.

TABLE 16.—*Cranial indices of South American series: Nasal index*

Series No.	Country	Male				Female			
		No. spec.	Mean±p. e.	Sigma	Range	No. spec.	Mean±p. e.	Sigma	Range
30	Brazil	1	52.8						
2	Colombia-Venezuela	22	51.6		44.4–61.4	17	51.4		44.9–58.3
8	Ecuador	9	51.5		45.0–57.9	3	51.0		47.9–53.1
7	Colombia	2	51.4		50.6–52.2	1	52.1		
15	Argentina	9	51.0		47.6–58.0	1	48.2		
3a	Venezuela	4	50.7		47.2–54.5	6	48.8		45.1–51.6
22	Perú	63	50.06±0.34	3.94	42.3–60.0	53	50.55±0.35	3.76	44.0–57.1
24	Brazil	5	49.8		43.8–53.4	4	49.2		47.7–53.3
23a	Perú	8	49.8		44.9–55.8	37	50.43±0.41	3.72	42.4–60.9
23	Perú	111	49.63±0.28	4.45	38.9–61.7	71	51.55±0.38	4.71	40.0–62.2
1	Colombia-Venezuela	44	49.45±0.45	4.41	40.0–58.7	24	53.6		43.4–65.9
39	Argentina	117	49.35±0.29	4.65	35.4–58.1	38	50.11±0.44	3.99	40.0–57.4
26	Ecuador	5	49.3		37.7–58.7	2	57.6		55.3–60.0
23b	Perú	31	49.24±0.54	4.50	42.6–63.0	23	51.0		41.4–53.5
35	Bolivia	1	49.0						
16	Argentina	5	48.9		43.1–52.7	2	45.2		44.2–46.1
32	Colombia-Venezuela	1	48.9						
3	Venezuela	14	48.8		44.1–52.8	27	48.69±0.52	3.97	41.6–55.6
13	Chile	25	48.64±0.42	3.10	44.4–56.5	6	48.7		46.1–51.0
28	Chile	4	48.6		39.2–56.5	1	46.8		
33	Brazil	2	48.6		48.1–49.0				
20	Perú	60	47.90±0.23	2.62	39.6–55.6	55	50.09±0.36	3.93	40.0–61.0
21	Perú	82	47.49±0.31	4.14	37.0–57.0	31	50.03±0.55	4.52	
11	Argentina	55	47.45±0.34	3.77	38.6–56.2	44	48.11±0.41	4.04	37.0–58.0
25	Brazil	30	47.42±0.43	3.53	40.0–52.9	15	46.7		40.9–53.9
9	Argentina	26	47.37±0.47	3.53	41.0–54.9	13	47.8		42.2–52.9
14	Argentina	16	47.35		43.1–52.9	6	52.8		51.1–53.6
12	Argentina	51	47.04±0.32	3.41	37.9–58.7	58	49.88±0.50	5.61	38.2–64.5
18	Tierra del Fuego	38	46.95±0.42	3.80	38.0–54.4	19	47.3		38.5–61.4
10	Argentina	91	46.72±0.31	4.23	37.0–61.7	58	49.06±0.34	3.79	43.1–59.6
6	Colombia-Venezuela	8	46.7		41.5–50.9	8	49.6		42.3–54.1
4	Venezuela	13	46.6		38.9–53.1	5	51.1		43.7–58.3
5	Venezuela	4	46.4		42.3–53.1				
17	Tierra del Fuego	26	46.07±0.58	4.35	37.7–56.5	10	47.4		39.7–54.4
19	Tierra del Fuego	12	45.9		40.7–50.9	11	49.4		45.8–53.8
34	Bolivia	1	45.6						
27	Brazil	5	42.8		40.0–45.2	3	47.9		42.5–52.3
29	Guianas					2	52.2		50.0–54.3
38	Chile					4	49.2		46.7–52.0
37	Paraguay					1	46.7		
Mean sigma				[1] 3.90				[2] 4.20	

[1] Number of series, 15; number of specimens, 850.
[2] Number of series, 10; number of specimens, 472.

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DEFORMITY, TREPHINING, AND MUTILATION IN SOUTH AMERICAN INDIAN SKELETAL REMAINS

By T. D. Stewart

Three kinds of artificial changes have been observed frequently in the skeletons of South American Indians. These are cranial deformity, trephining, and dental mutilation. Bones showing amputations have been found in Perú but are far from being as common as Mochica pottery represents.

Deformity.—Intentional shaping of the head in infancy was being practiced by a number of Indian tribes when they were first seen by Europeans (Hdk., 2:236; 4:526), but the practice was probably on the wane and in most places soon was banned. In prehistoric times there were three general centers of cranial deformity on the continent: (1) The Caribbean coast, with an extension through the Antilles; (2) the Pacific Coast in the region of Ecuador, Perú, and North Chile and extending back into the Highlands; and (3) the Coast of Argentina in the region of Río Negro and other Patagonian valleys. It is convenient to consider these centers separately, although they are not altogether discontinuous.

(1) The Caribbean center is limited to Colombia, Venezuela, probably British Guiana, and all of the inhabitable islands of the Antilles. Marcano (1893 a, 1893 b) has described some specimens from the upper reaches of the Orinoco drainage. There is no evidence that the custom extended much farther inland. Neither is there evidence that this custom spread from the Antilles into the Southeastern United States. Also, it is absent from Panamá and thus there is no direct connection with the Maya center.

The deformity here is predominantly of one type and should be classified as parallelo-fronto-occipital (or tabular oblicua of Imbelloni); that is, the frontal and occipital parts of the skull have been altered by pressure exerted in directly opposite directions. However, the occiput usually is not flat but is symmetrically rounded, whereas usually the frontal is markedly flattened and even concave. From this form it is judged that a small board was placed on the frontal and held in place either by a band passing around the occiput or by attachment to the ends of a board shaped to the occiput. Some of the early writers speak of the use of two boards, and yet it is difficult to visualize such an arrangement in the cases where the frontal is more extremely distorted than the occiput.

The only evidence of the antiquity of this custom here comes from Cuba. Harrington found undeformed "*Ciboney*" skulls that appeared to antedate the *Arawak* and *Carib* who practiced deformity.

(2) The Pacific Coast center begins in Ecuador and includes most of Perú, Bolivia, Northwest Argentina, and North Chile. There is no evidence as yet of the presence of this custom in southwestern Colombia connecting the Pacific and Caribbean centers. For instance, deformed skulls have not yet been found in association with the San Agustín culture (Pérez de Barradas, 1938). However, at the southern end of this area there is probably a thin connection with the Patagonian center.

In this great area all the principal types of deformity were present at different times or in different places. Little is known about the distribution and types in Ecuador, but at Paltacalo, near the coast, the parallelo-fronto-occipital type occurs (Rivet; per. com.). In North Perú, or at least in the Mochica area, the type becomes fronto-vertico-occipital (or tabular erecta of Imbelloni); in South Coastal Perú it is chiefly parallelo-fronto-occipital; in the Highlands of Perú and Bolivia it is chiefly circular; in Northwest Argentina it is again fronto-vertico-occipital; and in North Chile it is parallelo-fronto-occipital. Imbelloni's article in the present volume should be consulted for further details.

Imbelloni (1933) has made the most comprehensive survey of this region that thus far has been undertaken. Yet he was ignorant of the types in some places, and this led him to certain erroneous generalizations. Latcham (1937) has corrected these generalizations as they apply to North Chile and adjacent areas. Also, the writer (Stewart, 1943 a, 1943 c) has called attention to other errors in connection with Coastal Perú. Since the types vary sometimes from site to site and valley to valley, much work along this line remains to be done.

The different types were produced by various kinds of apparatuses, some of which, owing to the aridity of parts of this area, have been found with mummies. The circular type was produced, of course, by a band of cloth. A pseudocircular type resulted from the use of a band in combination with a doughnut-shaped pad on the occiput. When the child was placed in a cradle and the head held in place by pressure on the forehead, the fronto-vertico-occipital type of flattening was produced.

These variations in type are closely associated with culture and thus have chronological as well as geographical distributions. The oldest skulls yet found—Cupisnique, Paracas—are deformed. Thus the custom may have considerable antiquity here. Late crania are not so extremely deformed, as a rule.

(3) The Patagonian center comprises mainly Río Negro, Chubut, and Santa Cruz Territories of Argentina. A single type of deformity—fronto-vertico-occipital, with variations simulating the circular type—is found here. Some of the material showing this deformity is recent, but a considerable age is claimed for the so-called fossil Man of Monasterio (Castellanos, 1928 b), which shows marked frontal flattening. Imbelloni considers this center in more detail on page 54 of the present volume.

A large portion of the literature on the subject of cranial deformity is devoted to classifications of types. Gosse (1855) was one of the first to devise a comprehensive classification. His scheme was altered by Topinard, Virchow, Hrdlička, and other writers, so that today there is no standard terminology. In addition, those working with South American materials sometimes applied local names to types. Thus the terms "*Aymara*" and "circular" have become synonymous when applied to cranial deformity, although there is little justification for this.

Imbelloni has done more than anyone else to bring order out of this confusion. His classification is simple; it distinguishes primarily between the forms produced by small boards or other flattened surfaces (tabulares) pressed against the head and the circular form produced by a constricting band. Both of these forms are subdivided into vertical or erect and oblique forms, depending upon variations in the direction of the applied pressure. The reader is referred to Imbelloni's own statements in this connection on page 53 of the present volume.

Trephining.—Surgical removal of parts of the cranial vault during life has been practiced during historic times in Bolivia and Perú. (See vol. 5, p. 638.) The geographical and chronological distributions of the custom, as well as variations in technique, on the other hand, are known chiefly from skeletal remains. Judging from these remains, the custom rarely occurred outside the above-mentioned countries. A few specimens have been reported from Northwest Argentina, and it would not be surprising if others were found in North Chile.

Thus far, a few localities have furnished the majority of the reported specimens. Except for the Paracas Peninsula, where numerous specimens have been found, Coastal Perú has furnished only scattered examples. On the other hand, large numbers have been found in the Peruvian Highlands, particularly around Huarochirí and Cuzco. The Bolivian remains have come mostly from around La Paz. The frequency of the trephined skulls in collections from these several places are as follows: Huarochirí, 2–4 percent; Cuzco (Urubamba

River region, except Macchu Picchu), 17–21 percent; Bolivia, 5 percent; Paracas, 40 percent.

The Paracas skulls furnish the earliest record of this custon. Elsewhere, the skulls are usually attributed to the Late cultural period. Of the numerous sites about Cuzco yielding *Inca* remains, it is noteworthy that the burials at Macchu Picchu did not include trephined skulls, perhaps because the majority were females.

Three techniques for removing the trepan are generally recognized: (1) cutting or sawing, (2) scraping, and (3) drilling. Cutting was done in both straight and curved lines. Straight-line cutting, perhaps better designated sawing, produced angular openings, usually square or rectangular, with the cuts extending into the bone beyond the opening. Curved cuts were perhaps slower, but left a neater, rounded opening. Scraping usually damaged an area larger than the final opening and probably was slow. Drilling seems to have been used seldom, and then for small openings. The instruments employed were chiefly obsidian and quartz flakes.

Straight-line cutting or sawing seems to have been most common in the central Highlands about Huarochirí. Elsewhere, a combination of circular cutting and scraping was used. At Paracas some of the skulls present immense areas in which the bone has been removed by cutting and scraping down to the thin inner table. There is some question in these cases whether they may have been done post mortem, since there are no signs of healing.

The rate of survival from this primitive surgery was surprisingly high. Tello found advanced healing of the bone in 250 out of 400 cases (62.5 percent); Rogers in 37 out of 59 cases (62.7 percent); whereas MacCurdy found this stage in only 55.3 percent of 47 cases. MacCurdy, however, regarded the stage of healing as "partial" in another 23.4 percent.

The reason for the operation is not always apparent. This absence of apparent cause in their series of 19 skulls led Muñiz and McGee to suggest thaumaturgy as an explanation. Tello and subsequent writers have stressed the therapeutic nature of the procedure. Fractures are the principal indication for the operation. The Paracas skulls, according to Tello, are an exception in this regard, and this is further reason for believing that many of them may have been trephined after death.

The defect in the skull is said to have been covered in some instances by a disk of shell, metal, or other material. These disks, if discovered in situ, rarely have been described. Tello found a thin gold plate over a small trephine opening in one of his Paracas mummies.

Dental mutilation.—Chipping and filing of the teeth was practiced more commonly in historic than in prehistoric times, owing to the introduction of the African version of this custom by Negro slaves (Stewart, 1942 b). Inlaying of the teeth, on the other hand, was practiced only in Ecuador and in prehistoric times.

The prehistoric skulls with filed teeth thus far found come from Ecuador, Bolivia, Chile, and Argentina. Mutilation of the teeth by chipping was not practiced in prehistoric times, having been introduced by the Negroes. In Ecuador the filing was done primarily to make a bed for the inlay. However, in one case an upper canine and lateral incisor appear to have a shallow U-shaped groove on the occlusal border of each.

From the other countries of South America only about 7 specimens from prehistoric times have been reported. In some of these specimens the upper anterior teeth alone are involved, whereas in others it is the lower anterior teeth. In none is the full pattern of mutilation determinable, because of post-mortem loss of various elements. In most cases there is a single V- or W-shaped notch in the occlusal border of the tooth. A unique case from Santa Cruz, Argentina, presents a longitudinal V-shaped groove along the labial surface of the lower right first premolar. The practice in general was not common and probably was not old.

The examples of inlay are limited to three specimens, all of which come from Esmeraldas in Ecuador. Gold is the material inlaid. The number of teeth involved is variable; in the three specimens on record it is two, six, and eight—all upper anterior teeth. In most cases the inlays are circular but in one it is in the form of a band. Except in the use of gold, the Ecuadoran examples of dental mutilation resemble those commonly found in the *Maya* area.

In addition to these positive forms of mutilation, in which the teeth bear witness of their maltreatment, there is some evidence that a negative form known as ablation or the knocking out of a tooth—inferred from its absence in the skull—was also practiced in prehistoric times. Since teeth are lost in life through various causes, including accident and disease, a subjective element necessarily enters into the interpretation of the post-mortem dental remains. Hrdlička, who alone has summarized the evidence from crania on ablation, has examined considerable material from North America and Siberia, but of South American material only that from Perú. Here he found evidence of the practice in about 4 percent.

In historic times this practice has been separately introduced by Negro slaves.

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PATHOLOGICAL CHANGES IN SOUTH AMERICAN INDIAN SKELETAL REMAINS

By T. D. Stewart

Relatively few diseases leave their marks on bones, and those that do so are not always accurately identifiable long after death. The response of bone to various disease processes is limited, which is the reason for this lack of differentiation in the end results. Nevertheless, many osseous lesions in the bones of prehistoric groups give indications that aid in making historical reconstructions, whereas others give indications of dietary deficiencies and cultural habits.

The pathological studies made thus far on prehistoric remains from South America have been directed principally toward the identification of (1) chronic infectious diseases, such as syphilis, leprosy, and tuberculosis; and (2) degenerative changes such as arthritis, dental decay, and tumors or exostoses. The acute diseases, being much more rapid in their course, are less likely to leave marks, except when the bone is directly involved, as in mastoiditis. There were no unique diseases affecting bone in South America during prehistoric times, except possibly verruga and uta.

Chronic infectious diseases.—A controversy took place during the last decade of the last century, chiefly between Ashmead, Lehmann-Nitsche, and Virchow, as to whether the mutilations of the nose, mouth, hands, and feet represented in Mochica pottery should be attributed to leprosy, syphilis, or some other chronic disease. Virchow had originally identified the condition as leprosy, which view was strongly opposed by the others who were more inclined to regard it as syphilis or uta. Although nothing could be proved, this controversy served to focus attention on the antiquity of these diseases in the New World.

Since that time large amounts of skeletal material have been collected in South America, especially Perú, and these show remarkably little evidence of chronic infectious diseases. (Cf. Verneau, 1903; Hrdlička, 1911, 1914.) Much of this material is not accurately dated and hence included pathological specimens may possibly come from the historic period.

A determined effort was made by H. U. Williams (1932, 1936) to find evidence of pre-Columbian syphilis in South America. He finally decided on the basis of personal examination of many collections that there were only three specimens that would withstand close scrutiny both as to age and the nature of the disease. Two of these specimens were from Perú (Paracas and Cañete Valley) and the third was from Argentina (Río Negro).

As for tuberculosis, both Hrdlička (1911) and Moodie (1927 b) have noted bones from Perú that they believed could be examples of this disease. The identification of tuberculosis is somewhat more definite than syphilis because of the tendency of the former to localize in the spinal column and produce kyphosis, the condition commonly known as hunchback. García Frías (1940) studied three hunchbacked mummies from Perú believed to be prehistoric and demonstrated to his satisfaction that the lesions were due to tuberculosis.

The evidence in general seems to show that the presence of these chronic infectious diseases in South America during prehistoric times is not amply confirmed. Indeed, if they were present there at all, they were not very common. The evidence is perhaps best in the case of tuberculosis.

Degenerative changes.—There are certain changes in the skeleton, often becoming more pronounced with age, that may be characterized best perhaps as degenerative. Although age is undoubtedly a factor, there probably are other causal factors, such as nutrition, postural habits, and hereditary susceptibility, because the incidence of these changes varies among human groups. In the studies thus far made on South American Indian skeletal remains attention has been given principally to arthritis, dental decay, and tumors or exostoses.

The articular surfaces of bones sometimes present abnormal conditions, especially in advanced age. There is often a growth of bone about the edge of the joint. This is described usually as lipping. Also, there may be erosions of the joint surface together with polishing or eburnation. These conditions are usually termed arthritis deformans or hyperthropic arthritis. If, as seems true in the living, there are several varieties of arthritis, they have not been fully distinguished in the skeleton.

Hrdlička (1914) found arthritis to be the most common pathological condition in the bones of the ancient Peruvians. It occurred in 2 percent of 593 humeri, 2.7 percent of 255 radii, and 5.3 percent of 301 ulnae. Here it was confined almost entirely to the elbow joint. The knee joint of the femur was involved in 3 percent of 1,210 cases and of the tibia in 1.5 percent of 781 cases. An unusual feature of this collection was the frequent involvement of the hip joint—3.6 percent of 694 innominata. In these cases the head of the femur was deformed

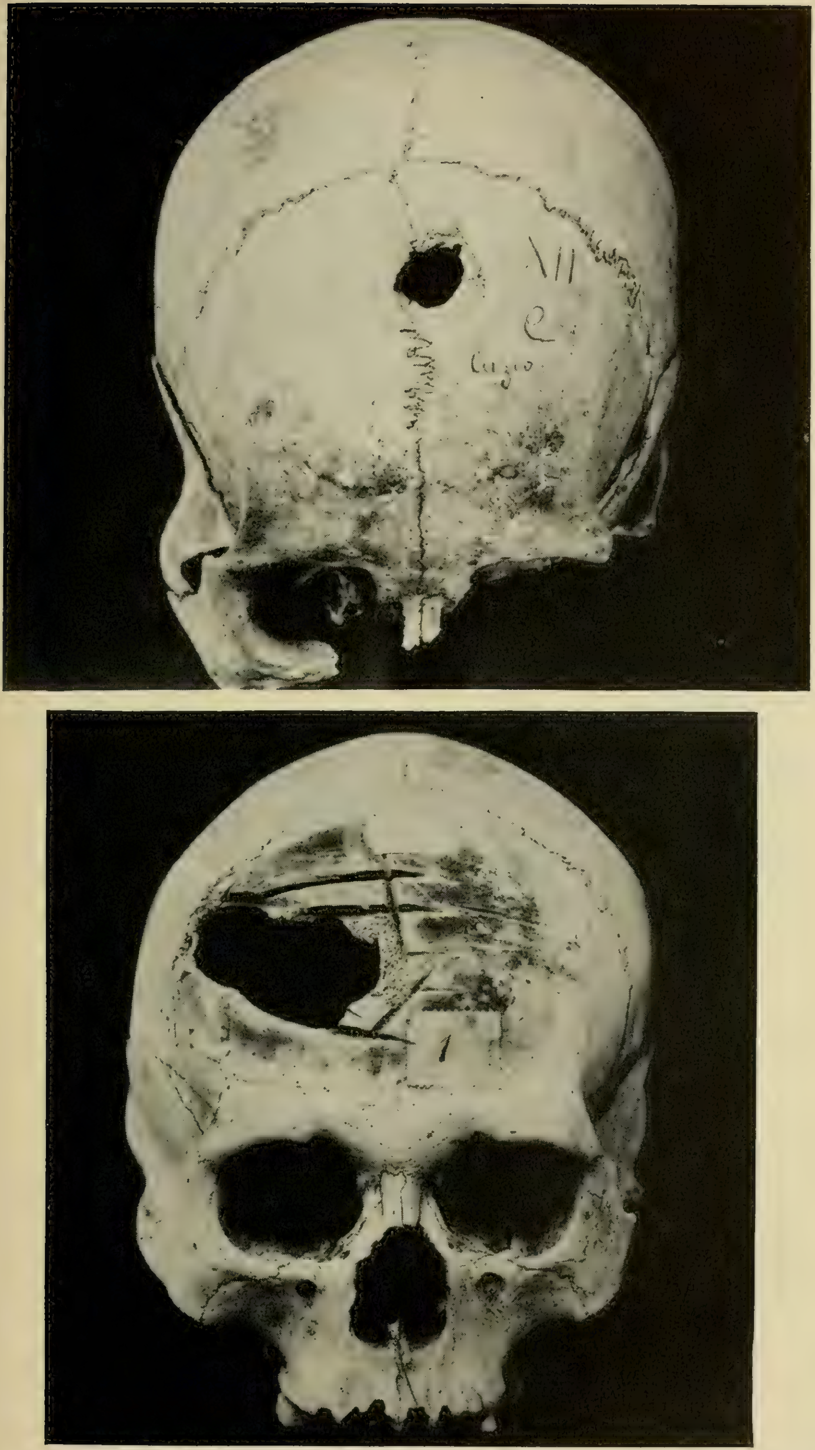

PLATE 9.—Trephined skulls from Perú. *Top:* Skull from Cuzco with trephined opening in midfrontal region, interrupting the course of the metopic suture. *Bottom:* Skull from Huarochirí with large trephined opening in the right frontal region. The technique used in this case is that of cutting or sawing. (Courtesy United States National Museum, skulls Nos. 178,480 and 178,473.)

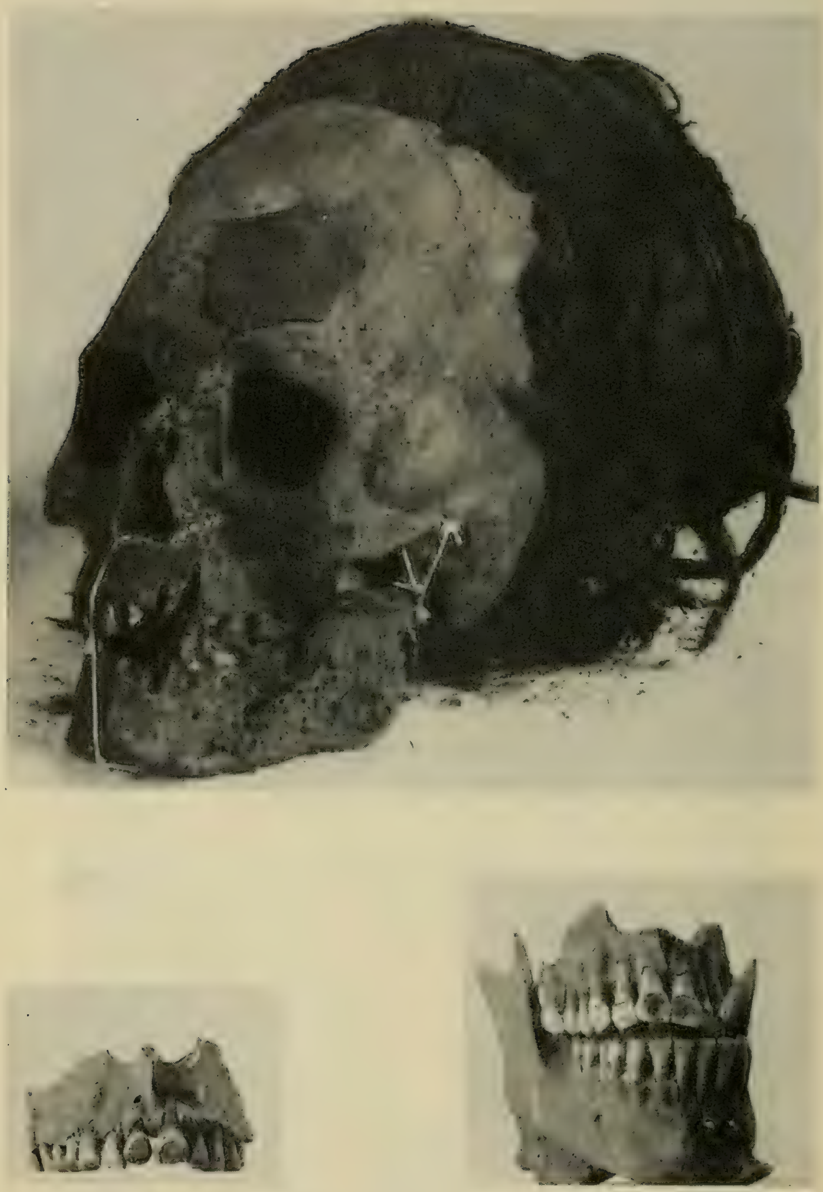

Plate 10.—Surgical and dental use of gold. *Top:* Skull of the Paracas Cavernas culture with gold plate in place on a trephined opening, left frontal region. (Courtesy J. C. Tello and A. Guillen.) *Bottom:* Inlaid teeth and gold-covered teeth, Atacames, Esmeraldas, Ecuador. (Courtesy Museum of the American Indian, Heye Foundation, New York.)

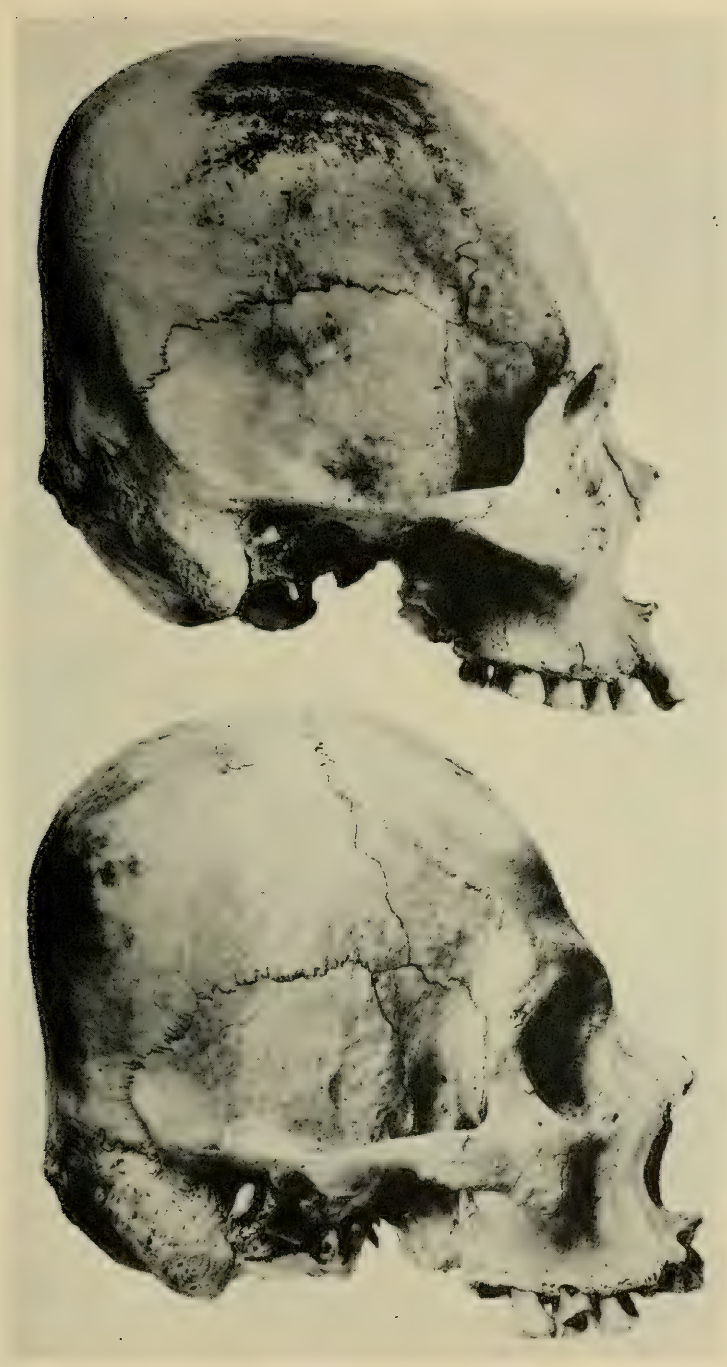

Plate 11.—Deformed skulls from Chicama Valley, Perú. *Top:* Lateral view of skull showing fronto-vertical-occipital deformity. Note ear exostoses. *Bottom:* Lateral view of deformed skull (tabular erecta of Imbelloni). (Courtesy United States National Museum, skulls Nos. 264,689 and 264,687.)

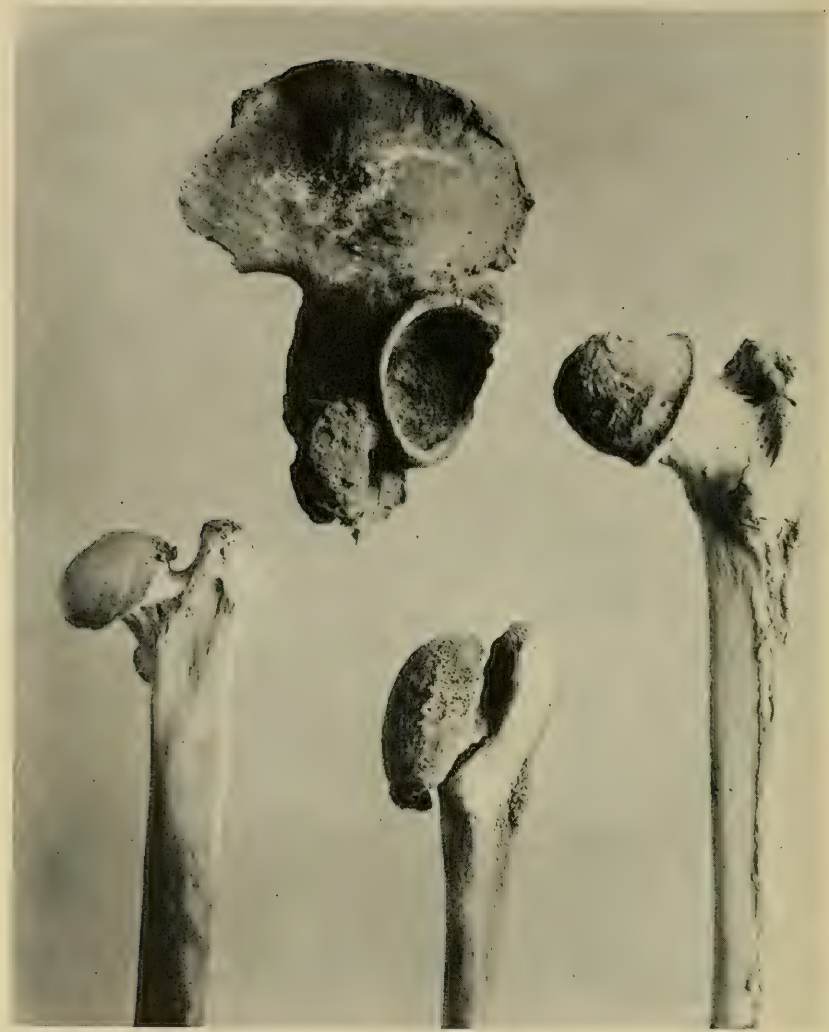

Plate 12.—Pelvis and femora from Chimu region, Perú, showing arthritis deformans. Pelvic bone and femur on right from one subject. Femur on left shows early stage of alterations; that in middle represents a very advanced case of flat "mushroom head," that on right a pronounced caput penis condition. (After Hrdlička, 1914.)

correspondingly into shapes that have been termed descriptively "capit penis" and "mushroom head."

Another collection that has been studied for this condition comes from the valley of the Río Chubut in Argentina (Lehmann-Nitsche, 1903 a, 1904 a). Here the humerus (329 cases), radius (234 cases), and ulna (233 cases) were involved, presumably at the elbow, in 1.8, 1.3, and 3.0 percent, respectively. The femur and tibia (knee joint?) were involved in 1.56 percent of 320 cases and 1.85 percent of 323 cases, respectively. The other joints, including the hip were seldom arthritic.

Data on the vertebral column, which frequently shows arthritic lipping, are lacking, chiefly because this part rapidly disintegrates post mortem or is not always collected. Vignati (1931 c) has called attention to crania from Northwest Argentina with arthritic temporomandibular joints. This is not an unusual finding.

Dental diseases are perhaps a contributing cause of arthritis. However, Moodie (1928 e) has been the only one to show the association of these two conditions in South American Indian remains. Most of the studies on the teeth have been made on Peruvian materials (Leigh, 1937; Moodie, 1928 d; Stewart, 1931), and have been concerned primarily with dental caries. This appears to have been the chief cause of ante-mortem tooth loss in Perú. Cavities first appeared in the developmental pits and fissures on the crowns of the molars and then on the approximo-cervical surfaces of all the teeth. Attrition did not often lead to tooth loss. The caries, however, started off a course of events that frequently led to tooth loss with varying attendant complications, including abscess and antral fistula.

In view of the widely differing environments in South America and the different diets of the native peoples that this entails, a broad study of the dental conditions here in prehistoric times would contribute to the knowledge of their etiology.

Bone tumors and exostoses may occur in almost any part of the skeleton although they show a preference for certain sites. Their cause is unknown. One of the most common forms occurs in the auditory meatus and is usually called "ear exostosis." Hrdlička (1935 a) has observed these in 14.3 percent of a large series of Peruvian skulls (11.7 percent of the ears). As usual, the condition was more common in males (22.2 percent as compared to 6.3 in females). Möller-Holst (1932) reports finding ear exostoses present in 16.7 percent of 341 Chilean and Bolivian skulls. On the other hand, Ten Kate (1896 a) found no exostoses in a series of 110 Calchaquí. The frequency of this condition in other groups has not yet been reported.

The so-called "third trochanter" of the femur is an exostosis or hyperostosis with somewhat of a functional association. Hrdlička (1937) has found this structure developed to varying degrees in 32.6 percent of a large series of Peruvians. It tends to be more common in females (36.4 vs. 29.6 percent) and on the right side (males: 30.1 vs. 29.1; females: 37.9 vs. 34.6 percent). Costa (1890) found it present in 84.4 percent of 45 Fuegian femora, whereas Klimann (1938) found it in only 16.6 percent of 90 femora from Northwest Argentina (*Diaguita*, etc.). Similarly, in the Patagonians Verneau (1903) gives figures for the third trochanter varying from about 50 to 80 percent depending on stature (number of femora not stated), whereas Klimann (1938) reports it in 20.7 percent of 53 femora. These variations in figures probably indicate that there is a wide variation in the concepts of what constitutes the third trochanter as distinguished from the ordinary gluteal ridge or crest.

Still another hyperostosis occurs at times on the inner side of the lower jaw in the region of the premolars and molars. This condition apparently does not occur commonly in the jaws of South American Indians. Hrdlička (1940 a), who alone has studied it, but only in Peruvians, reports slight hyperostoses in 3.8 percent of males and 3.1 percent of females.

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Arthritis.—Hrdlička, 1914; Lehmann-Nitsche, 1903, 1904 a; Verneau, 1903; Vignati, 1925 c, 1931 c.

Dental caries.—Leigh, 1937; Moodie, 1928 b, 1928 c, 1928 d, 1928 e, 1928 g, 1931 a; Stewart, 1931.

Tumors.—Costa, 1890; Hrdlička, 1935 a, 1937, 1940 a; Klimann, 1938; Möller-Holst, 1932; Moodie, 1926 b; Oetteking, 1928.

See also the following.—Burton, 1927; Constanzó, 1942 c; Lehmann-Nitsche, 1902 a; Moodie, 1928 a, 1928 g; Moreno, 1880; Outes, 1915; Price, 1939; Stegmann, 1904; Thulie, 1877; Vergara Flores, 1895 b; Virchow, 1886 a.

CEPHALIC DEFORMATIONS OF THE INDIANS IN ARGENTINA

By José Imbelloni

A study of the map of aboriginal deformities in Argentine territory, in connection with a map of South America, immediately reveals that the Argentine areas of peoples who deformed are a direct continuation of the areas of Andean culture. To state this more precisely, one observes in the northwestern, western, and northern provinces a complex of abnormal shapes which are related to the cultures of the ancient Peruvian and *Atacameño* zone, and in the southern regions, a second complex linked to the deforming practices of the *Araucanian* area of Chile.

The first complex includes a larger number of shapes or models; the second includes only one, although it has adopted various specializations in its implements (pls. 13, 14).

The following regions of Argentina belong to the first area: (1) The Puna of Jujuy, (2) the Quebrada of Humahuaca, (3) the *Diaguita* area, (4) the area of *Diaguita* influence.

(1) The Jujuy tableland contains the three artificial shapes: flat, vertical (tabulares erectos); flat, oblique (tabulares oblicuos); and annular (anulares). These apparently occur irregularly, although it may be said that the tableland, taken as a whole, acts as a sort of canal, on whose eastern side is found the flat oblique type of Humahuaca, and on the western side the *Atacameño* annular type, while in the central part, from north to south, flows the deeper stream of the vertical, flat form.

(2) The Humahuaca territory (the Quebrada with the same name) contains only flat, oblique deformation. We know of many hundreds of crania from the valley, of which only two or three are annular and undoubtedly came from neighboring regions. This region is the most homogeneous in its artificial molding.

(3) The *Diaguita* area, which includes the provinces of Salta, Catamarca and parts of Jujuy, la Rioja, Santiago del Estero, and San Juan, shows an overwhelming predominance of the flat types (among 542 crania there, 512 were flat and only 30 annular), and of the two flat types, almost 90 percent were vertical, whereas only 10 percent were oblique.

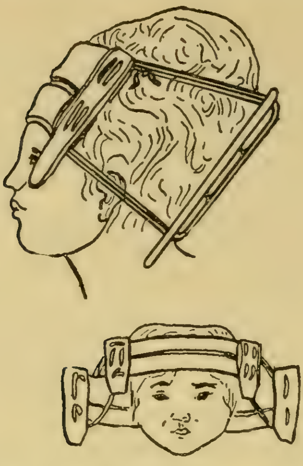

FIGURE 2.—Diagram showing the application of head flattening apparatus, Quebrada de Humahuaca.

(4) The area of *Diaguita* influence extends to the remaining territory of San Juan, a part of Córdoba, and some of Santa Fé, in which more or less sporadic finds reveal the presence of deformed crania of both flat types, although their development in that area is less characteristic and few crania show annular deformation.

To the second area belong the ancient inhabitants of the valleys of Patagonia whose northern limits do not stop at present political boundaries.

In the political divisions of Río Negro, Chubut, and Santa Cruz, and the southern part of the Province of Buenos Aires, deformed crania have been found, often in large numbers, although always in a cultural level above the layer of typically Pampean dolichocephals, who represent the truly ancient peoples of the Patagonian region. The plateau-dwellers who practiced deformation generally used the flat, vertical type. Rather numerous specimens from Río Negro and other scattered sites in the southern part of Buenos Aires reveal a curious specialization of this general type, the "pseudocircular" shape.

Among the instruments which native mothers used to mold the tender heads of their young children, we are familiar with that typical of the Quebrada de Humahuaca, an apparatus of "free" boards applied to the forehead and the occiput (fig. 2). This consisted of two boards, each composed of several layers of soft algarroba wood a little more than 1 mm. in thickness; the smaller was placed on the forehead, the larger on the occiput, with its center in the region of the inion; the two boards were then drawn toward each other by tightening the slender strands of wool which passed around them.

A device of two "free" boards, similar to the one described above,

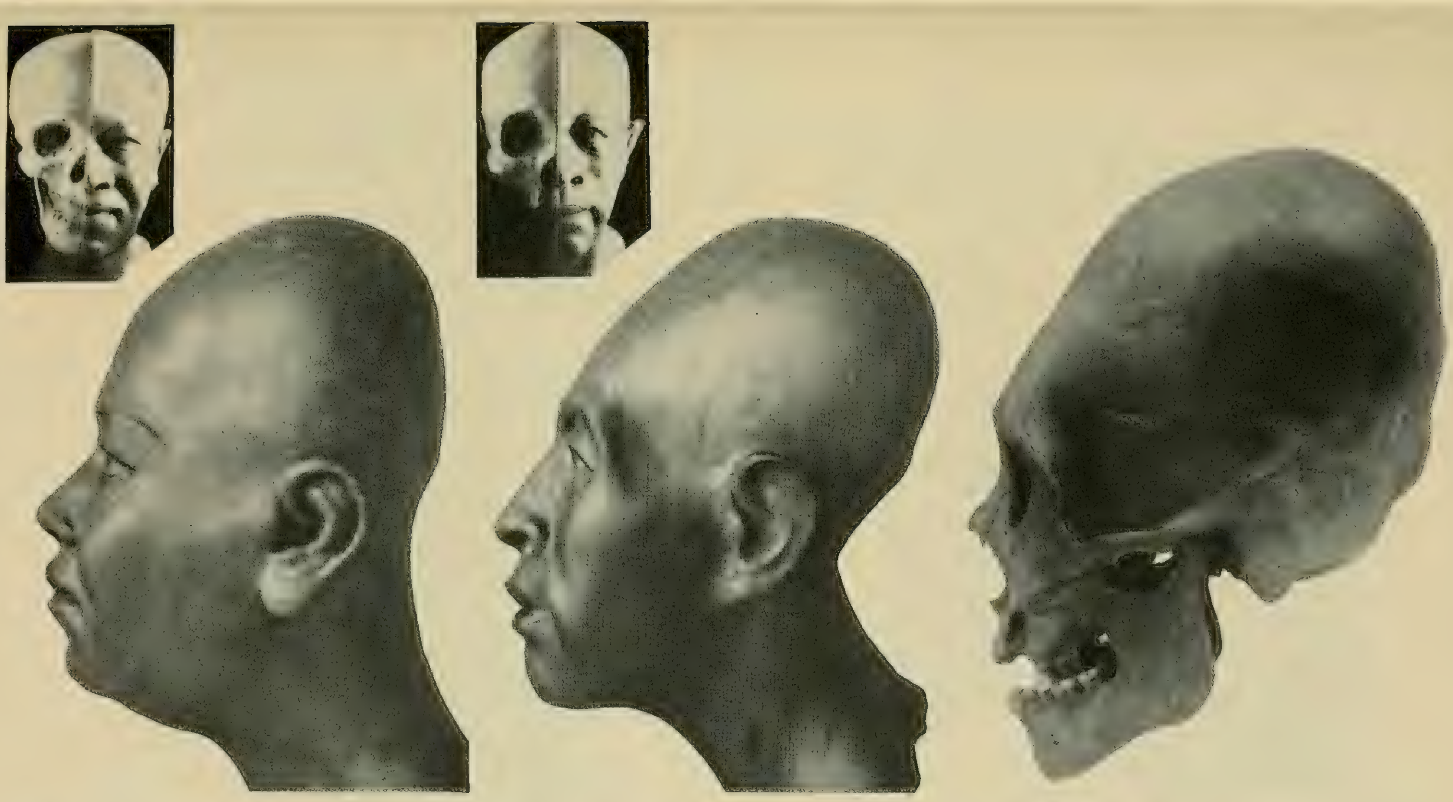

Plate 13.—Types of Argentine cranial deformation. *Left:* Lateral and front views of tabular erecta deformation. Reconstruction from skull of young woman, Calchaquí Valley. *Center:* Lateral and front views of tabular oblicua deformation. Reconstruction from skull of a man, Quebrada de Humahuaca. *Right:* Skull showing most common type of annular deformation in Argentina. (Courtesy José Imbelloni.)

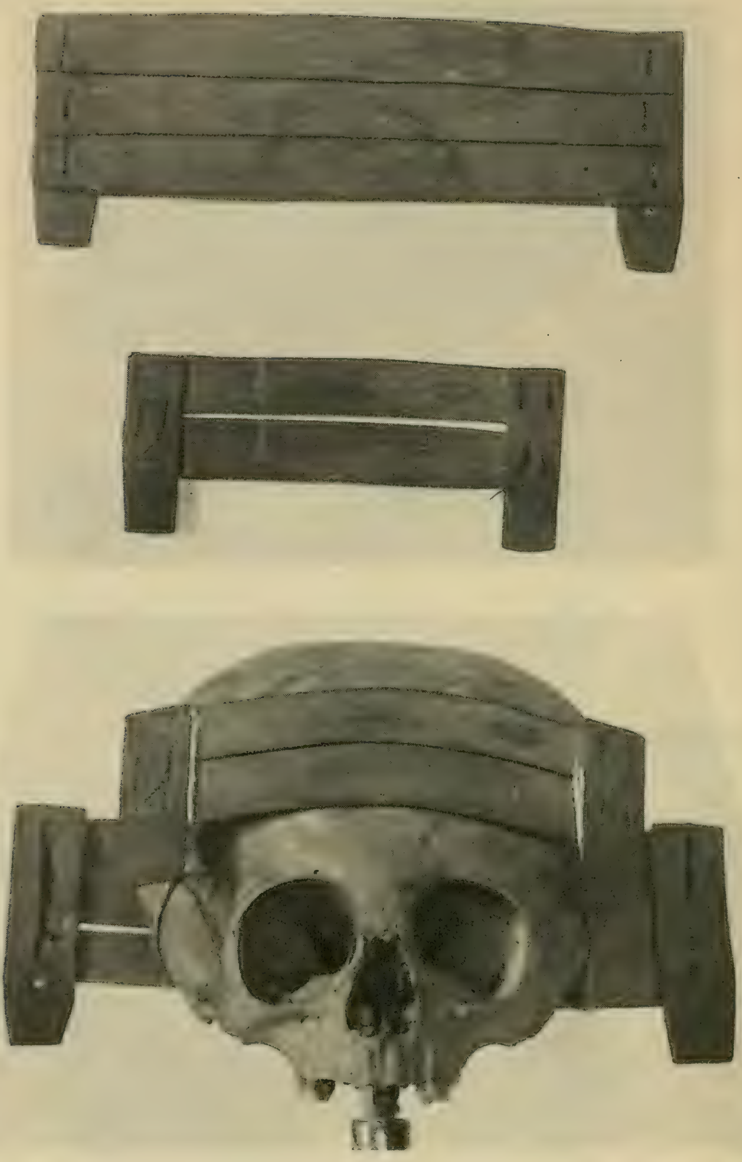

PLATE 14.—Apparatus for cranial deformation, Argentina. *Top:* Two wooden tablets of the apparatus for tabular erecta deformation. The frontal tablet measures 15.1 cm. (6 inches) and the occipital tablet 22.7 cm. (9 inches). *Bottom:* The apparatus applied to an infant's skull. (Courtesy José Imbelloni.)

with each board made up of thin layers of hardwood or of one whole piece, must have been used throughout the entire area of flat, oblique deformation.

By contrast, annular deformation was accomplished by means of bandages and belts wound about the head to bind it in the manner of a kerchief or coif.

Flat, vertical deformation is done with an appliance which differs sharply from those just described. Whereas the "free" boards were applied only to the head, leaving the child free to move, flat, vertical deformation required an apparatus applied to the body, which held the child with his head pressed against a flat plane (cradles). The cradles with which we are familiar from the ancient ethnography of the southern part of Argentina are constructed of pieces of wood and boards fastened with rawhide thongs and are so made that they can be stood upright on the ground or carried on the back of the Indians or on horseback.

We have not yet found traces of the instruments used for deformation in the Río Negro region, but examination of the "pseudocircular" crania assures us that the child's head was fastened to the cradle, not by the pressure of a board on his forehead, but by means of a kerchief or elastic bands which produced the characteristic convexity—described as cylindrical-conical—of the forehead.

In general, the cephalic deformities shown by aboriginal crania excavated from Argentine territory are the result of cultural influences emanating from the Andean-Pacific area, just as are all the South American deformities in general. The flat, vertical type belongs to the West Coast, from Tumbez southward; the flat, oblique type prevails in the zone of Manta and Esmeralda; the annular, derives from the coast of Atacama and Arica and extends across the ancient Peruvian territory toward the Montaña on one side and on the other descends southward toward the Puna. The distribution of the latter suggests great antiquity.

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See also the following: Bloxam, 1882; Dillenius, 1910, 1912 a, 1912 b; Imbelloni, 1938 d, 1940; Villagra Cobanera, 1938.

ANTHROPOMETRY OF SOUTH AMERICAN INDIANS

By MORRIS STEGGERDA

The Indians of South America, like those of the northern continent, vary greatly in their physical proportions. One cannot describe them collectively as being either tall or short; as having broad or long heads, long trunks or short arms; or even as having a dark skin color, or straight, black hair. For one finds exceptions to nearly every general statement that might be made about such a large group of people. Although such statements may apply to particular tribal groups, they are not appropriate to describe South American Indians as a whole. Therefore, rather than to present generalizations all of which would need modification, it is the purpose of this short article to tabulate the mean statures and cephalic indices for as many tribal groups as possible, and to indicate the availability of additional anthropometry for each group (pls. 15 to 22).

The accompanying table lists 88 Indian tribes, with their linguistic affinities[1] and their approximate locations. In addition to the stature and cephalic index for each tribe, all the available anthropometry is indicated by bibliographic reference. The number of individuals considered in each article is indicated, as well as the relative value of the article from the point of view of the number of dimensions considered.

From the original sources it appears that the range of mean statures for the males is very great; namely from 145 to 184 cm. However, the mean of 145 is quoted from Roquette-Pinto (1938), who failed to indicate the number of individuals measured that went to make up the mean; and the figure 184 is based on only two *Ona* males recorded by Lehmann-Nitsche (1927). This wide range is greater than that found by Steggerda (1932) for North American Indians. In the present table the upper extreme of this range is somewhat modified by presenting a figure which is the average of the means recorded for the *Ona*. Thus the table shows a range between 145 cm., for an unknown number of *Aruakí* Indians as cited by Roquette-Pinto (1938), and 176 cm., representing a mean of four separate studies of the *Tehuelche*.

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[1] In addition to the sources cited in table 1, see also J. A. Mason, this vol., pp. 157-317.

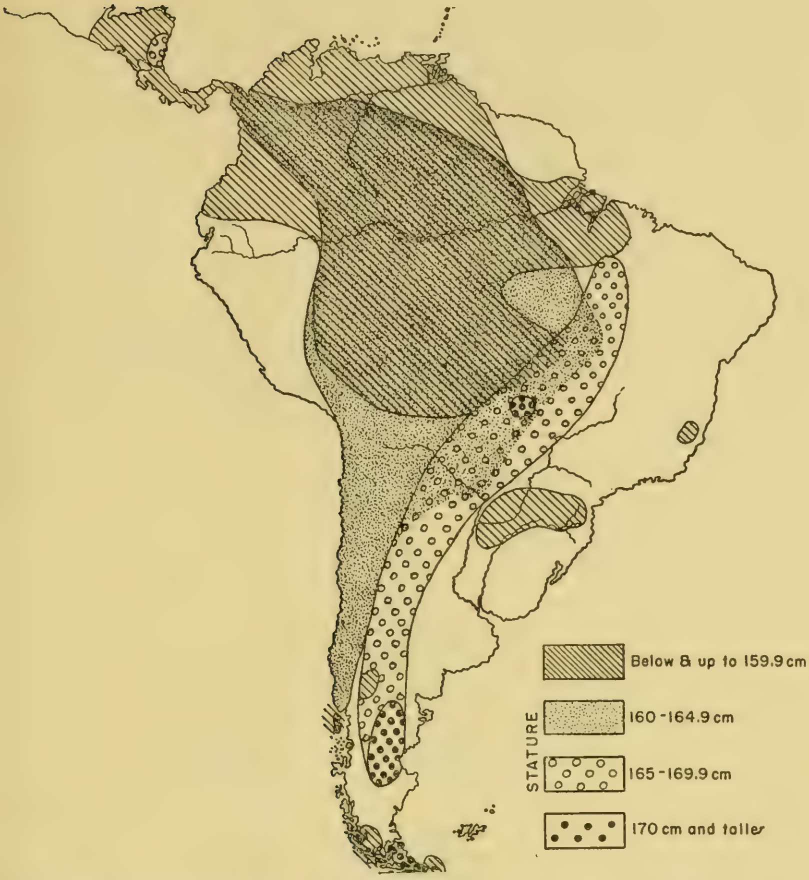
By summarizing the studies in each tribe we are able to present, for the first time, some very adequate means; as, for example, for the *Ona*, where measurements of 85 males and 108 females are used to make one mean, and for the *Quechua*, where the mean figures are based upon 6 different studies comprising 446 males and 77 females. Similarly, for the *Yahgan*, 9 original sources are summarized in a mean based upon 450 male subjects.

On map 4 the recorded statures of males are plotted according to geographical distribution, based upon the data of the original sources. From this map it will be seen that the small statures below 160 cm. are found in the northwest and continue southeastward to more or less the center of the Continent, with a few scattered groups in southern Paraguay and Brazil. Those between 160 and 165 cm. occupy nearly the same area, but continue farther south along the western part of the Continent, far into Chile. The next taller group, of 165 to 170 cm., occupies a long, narrow strip reaching from northern Brazil to southern Argentina. Still taller Indians, averaging above 170 cm., are found in the southern part of South America, and at its southernmost tip. A small group of very tall Indians, the *Bororo*, occupies a small region in central Brazil, as indicated on the map.

The cephalic index of South American Indians has been treated similarly, except that males and females have been grouped together to form one mean. This seems justifiable, since there is no significant sex difference in adults for this index. The range, according to our present table, is from 76 percent for two tribes belonging to the *Ge* group to 90 for the *Setebo*, a *Panoan* tribe. The means shown in this table are weighted means covering all the work done on a particular tribe. On map 5 the distribution of South American Indians by cephalic index is plotted according to information given in the original articles. It will be noticed that the long-headed Indians (76 to 79.9) are located centrally and to the south, while the broader-headed, mesocephalic Indians (80 to 84) are also centrally placed, but farther to the north. The brachycephalic Indians are restricted more or less to a narrow band along the Andes. This band of broad-headed Indians extends north from Panamá up through Central America, along the Gulf coast of México, and then north through the western United States (Steggerda, 1932, p. 84).

As has been said, it is difficult to describe South American Indians in general. Yet if one breaks them up into linguistic groups, certain statements concerning their physical features may be made.

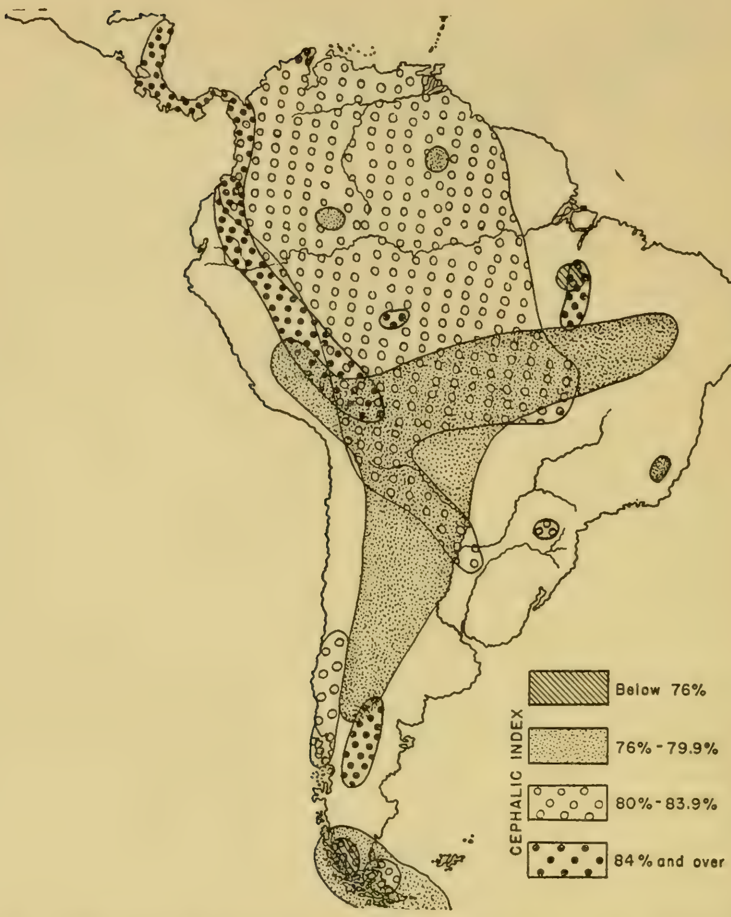
Carib.—Recorded anthropometry is present for 13 *Carib* tribes. In general, they are relatively short in stature, averaging 159.4 cm. for males and 147 cm. for females. Their arms are relatively long, with an average relative span of approximately 105, which corresponds closely



MAP 4.—Distribution of stature among South American Indians. Males.

with that found by the author for the short *Maya* of Yucatán (104.7). Their shoulder width averages 36.6 cm., which, for so short a people, may be considered broad; the Yucatán *Maya*, as measured by the author, averages 38.0 cm. Their heads are longer and narrower than those of the average *Maya*. They are mesocephalic, with an index of 80, whereas the cephalic index for the *Maya* is 85. The *Carib* face and nose are not as broad as those of the *Maya*. The averages for various measurements on eight *Carib* tribes show them to be short, thick-set, with broad shoulders and relatively long arms.

Arawak.—Of 36 tribes listed as *Arawak* on Krickeberg's linguistic map (Buschan, 1922), we have found recorded anthropometry for 15. The average stature for 151 males of these 15 tribes is 158.7 cm., which is practically the same as that found for the *Carib* (159.4 cm.). The



Map 5.—Distribution of cephalic index among South American Indians. Mean of males and females combined.

Mehinacú and the *Paumarí* Indians are fairly tall; but others, such as the *Ipurina*, *Atoraí*, and *Goajiro*, are relatively short in stature. The female/male index for stature of the *Arawak* is 93 percent, which corresponds closely to the average human sex difference for stature. Their relative span is 104.6, again in close correspondence with that of the *Carib* and the *Maya* Indians. Their trunk length, as indicated by the relative sitting height, is 51.2—practically the same as the average relative sitting height for Indians in general. In shoulder width they are even broader than the *Carib*, although their average stature is 7 mm. less. These small differences may be insignificant, but the measurements show the *Arawak* also to be a short, stocky, broad-shouldered Indian.

In head length the *Arawak* equals the *Carib*—185 mm. as compared with 184.9 mm. In head width the average is the same, making the cephalic index also 80. Their faces, as judged by the bizygomatic breadth, seem slightly broader than those of the *Carib*, and their nose width as judged by the nasal index is also greater than that of the *Carib*.

Tupí-Guaraní.—There are 11 tribes listed as *Tupí-Guaraní* that have been measured. The average stature for males of these 11 tribes is 160 cm., making them slightly taller than either the *Carib* or *Arawak*. They, too, are mesocephalic, having an average cephalic index of 80.6.

According to the literature, the appearance and measurements of the *Tupí-Guaraní* vary considerably among the different tribes. The *Tiatinagua*, of which only 4 were measured by Farabee (1922), have a mean cephalic index of 76.31, which is the lowest of any of these groups. While not differing greatly from other *Tupí* tribes in stature, they are described as having very slender bodies, long faces, and long hands. Their minimum frontal measurement is the lowest of all, due to a marked depression at the temples. The *Mundurucú* and their neighbors are small of stature, never exceeding 160 cm. The Indians of the upper Xingú are taller, 162 cm., and are mesocephalic (80.4), with brown skin, straight nose, salient cheek bones, and wavy or straight hair. The *Guaraní* average 166 cm. in stature, and tend to be brachycephalic. The *Auetö* are mesocephalic (80.2 to 81.8 in male and female), and short of stature (158 and 152 cm.).

Panoans.—The *Panoans*, found in the southwest of the Amazon Basin, are, according to Pericot y García (1936), small of stature (160 cm. or less) and brachycephalic. The *Mayoruna* (*Barbudo*), described by Markham (1894–95), are taller than most of the other *Panoan* tribes, and have thick beards and a light-colored skin.

Eastern Brazil.—In eastern Brazil are such tribes as the *Botocudo*, *Cayapó*, *Cainguá*, and *Coroado*. According to Pericot y García (1936), the *Botocudo* are markedly dolichocephalic; they have strongly developed supraorbital ridges, are prognathous, with strong inferior mandibles and a reduced cranial capacity. Their stature is small (158 cm.), and their extremities are slender. The *Cayapó* are taller and brachycephalic, have a lighter skin color, and are better built. The *Coroado* and *Cainguá* are of medium stature, rather slender and well-proportioned. They have an oval face, horizontal black eyes, and dark skin, which sometimes tends to be lighter, according to the region inhabited.

Chibcha.—The *Chibchan*-speaking peoples appear to be very short in stature, with relatively long arms and broad shoulders. They are brachycephalic.

Quechua.—Eickstedt (1934), who deals in detail with the

Quechua, says that their body build is massive, the head short, and the face medium-short. Their stature is also rather small. The nose is often arched and the cheek bones are salient; the forehead is low, and the hairline, coming down quite low on the forehead, makes it appear still lower. The orbital ridges are not very strongly developed, and the eyes are not deeply set. The length and shape of the nose, together with the beardless face, lend a very characteristic appearance to the *Quechua* Indians. The chest, shoulders, and hips in both sexes are well developed.

Araucanians.—The dominant physical feature of the *Araucanians* is according to Pericot y García (1936), a low stature—161 cm. for males, and 143 cm. for females. In the *Araucanians* of Argentina, brachycephaly is accentuated. The cheek bones are slightly salient, the nose straight or convex; the eyes are small and dark, the mouth large, the hair dark and straight. Their build is robust, with wide shoulders and small extremities; the skin is light brown to olive. (See also p. 129.)

Other groups.—Short descriptions could be written of other groups, for example, the *Ona, Yahgan, Alacaluf, Bororo,* and *Witoto,* but the reader is referred to the table to determine where the literature may be found. (For the *Ona, Yahgan,* and *Alacaluf,* see p. 121.)

There seems to be a specific need for further information on Indian tribes from most localities in South America; perhaps this discussion might suitably end with an appeal to South American anthropologists to make additional surveys for their particular areas, and then to circulate their findings more widely.

TABLE 1.—*Stature and cephalic index of 88 South American tribes, with source and evaluation of other anthropometric data*

Tribe	Linguistic group	Location	Stature (cm.)				Cephalic index[3]		Source	Rel.[4] value	No. of subjects		Remarks, general physical characteristics, and some additional anthropometry
			No.[1]		Means[2]		No.[1]	Mean[2]					
			♂	♀	♂	♀	♂ and ♀	♂ and ♀			♂	♀	
Alacaluf	Independent	51° S.–74° W.	28	34	156.4	146.3	72	78.46	Lehmann-Nitsche, 1908a	3	8	6	Often referred to as "Canoe Indians." Skottsberg (1913) says, "Their arms and upper bodies are strongly developed and their legs are thin and bent."
									Lehmann-Nitsche, 1916d	1	-----	2	
									Pericot, 1936	3	-----	-----	
									Outes, 1909	2	2	7	
									Garson, 1885	3	-----	-----	
									Eickstedt, 1934	2	15	16	
Amahuaca	*Panoan*	9° S.–74° W.	2	----	160.0	-------	2	81.46	Farabee, 1922	1	2	-----	According to Markham (1894–95), these Indians have beards.
Angachagua	*Quechua*	1° S.–78° W.	25	----	158.3	-------	25	80.09	Gillin, 1941	1	25	-----	Numerous somatological observations are given (Gillin, 1941).
Arara	*Carib*	4° S.–55° W.	----	----	161.1	-------	----	-------	Roquette-Pinto, 1938	2	-----	-----	Biacromial breadth, head length and breadth, bizygomatic breadth presented in two tables, Roquette-Pinto (1938, pp. 197–209).
Araucanian	*Araucanian*	35° S.–67° W.	6	2	162.0	152.8	8	82.20	Lehmann-Nitsche, 1908a	3	4	1	Latcham (1904b) gives stature range for males 163.0–163.5, females 142.0–144.0 cm. He also gives many somatological observations. (See also this volume, p. 129).
Arawak	*Arawakan*	6° N.–57° W.	16	9	155.0	147.0	25	83.17	Lehmann-Nitsche, 1908a	2	16	9	
									Ten Kate, 1887	------	-----	-----	Pericot (1936) states that some present-day *Arawak* of the Andes induce malformations of the head.
Aruakí	*Arawakan*	2° S.–59° W.	----	----	145.0	-------	----	-------	Roquette-Pinto, 1938	2	-----	-----	
Aturaí	*Arawakan*	2° N.–58° W.	4	4	159.2	142.5	8	81.05	Bastos d'Avila, 1937	1	4	4	Additional data: weight—males 64 kg., females 52 kg.; chest girth—males 890 mm., females 850 mm.; nasal index—males 71.4, females 66.8.
Auetö	*Tupí*	13° S.–54° W.	39	11	158.7	151.4	52	80.20	Ehrenreich, 1897a	2	14	2	Lehmann-Nitsche (1908a) gives many excellent photographs.
									Lehmann-Nitsche, 1908a	2	25	9	
									Roquette-Pinto, 1938	2	-----	-----	
Aymara	*Aymara*	16° S.–70° W.	265	7	158.0	147.8	272	82.06	Rouma, 1913	1	25	-----	Rouma's studies (1913) were made in two localities: Hacienda de Sta. Rosa, north of Yungas, La Paz; Finca de Pillapi, Province of Ingave, La Paz.
									Rouma, 1913	1	25	-----	
									Chervin, 1907	3	104	7	
									Eickstedt, 1934	3	111	-----	
Bacaïri	*Carib*	14° S.–55° W.	10	6	160.8	151.6	18	79.32	Ehrenreich, 1897a	1	10	6	Ehrenreich (1897a) describes them as having low foreheads, prominent aquiline noses, small eyes, prognathism, and wavy hair.

TABLE 1.—*Stature and cephalic index of 88 South American tribes, with source and evaluation of other anthropometric data*—Continued

Tribe	Linguistic group	Location	Stature (cm.)				Cephalic index [3]		Source	Rel.[4] value	No. of subjects		Remarks, general physical characteristics, and some additional anthropometry
			No.[1]		Means [3]		No.[1]	Mean [2]					
			♂	♀	♂	♀	♂ and ♀	♂ and ♀			♂	♀	
Baré	*Arawakan*	2° N.–66° W.	1		154.5		1	82.60	Bastos d'Avila, 1937	1		1	Additional data for males: chest girth 880 mm., shoulder width 380 mm., nasal index 66.0.
Bororo	Independent	17° S.–55° W.	20	6	173.7	160.5	26	80.32	Lehmann-Nitsche, 1908a	2	20	6	Lehmann-Nitsche (1908a) says they have prominent supraorbital ridges; salient cheekbones; heads large and round; eyes small, oblique, and far apart.
Botocudo	*Ge*	19° S.–42° W.	10		158.6			76.60	Eickstedt, 1934	3			Markham (1894–95) says they have a very low type of skull. Pericot (1936) describes them as markedly dolichocephalic, with strongly developed supraorbital ridges.
Cágaba	*Arawakan*	5° N.–75° W.	28	22	159.4	146.9	50	84.53	Roquette-Pinto, 1938; Mason, G., 1940.	2	28	22	G. Mason (1940) gives additional dimensions: nasal index—75.9 males, 71.7 females; facial index—84.0 males, 81.7 females.
Cainguá	*Tupí*	23° S.–56° W.	2	2	154.5	147.0	4	80.90	Lehmann-Nitsche, 1908a	3	2	2	Pericot (1936) describes them as short, mesocephalic, brown-skinned, with hair sometimes wavy.
Calchaquí	*Quechua*	28° S.–66° W.	6		168.5			78.20	Ten Kate, 1896a	3	6		Kuniko (1911) presents a skeletal study concerning these people.
Camaiura	*Tupí*	12° S.–54° W.	14	4	164.1	153.7	18	79.17	Lehmann-Nitsche, 1908a	2	14		Lehmann-Nitsche (1908a) quotes Ehrenreich as saying that these Indians have a low face and forehead and a round chin.
Carajá	Independent	10° S.–50° W.	12	9	168.9	152.8	21	76.94	Lehmann-Nitsche, 1908a	2	12	9	Buschan (1922) describes them as having a dark-brown skin color. A widespread skin disease makes their skin spotty.
Carib	*Carib*	6° N.–56° W.	3	6	149.8	141.0	9	82.44	Ten Kate, 1887	2	3	6	
Carib, Barama R.	*Carib*	8° N.–59° W.	104	99	156.8	145.8	203	80.73	Gillin, 1936	1	104	99	This is an excellent anthropological study (Gillin, 1936).
Cauishana		3° S.–65° W.			160.0				Roquette-Pinto, 1938	2			Location uncertain.
Cayapa	*Chibchan*	2° N.–79° W.	19	21	155.1	146.4	40	85.30	Barrett, 1925	1	19	21	These Indians are adequately described in Barrett (1925), a large two-volume study.
Cayapó	*Ge*	5° S.–50° W.	5	2	167.6	154.5	7	84.19	Lehmann-Nitsche, 1908a	2	5	2	Pericot (1936) states that the *Cayapó* are taller and more brachycephalic than other *Ge*-speaking people.
Chango	*Araucanian*	30° S.–73° W.			160.0	145.0			Latcham, 1909	3			

Chilote	*Araucanian*	43° S.-73° W.	50	----	160.3	----	----	80.90	Outes, 1909	2	50	----	Latcham (1909) gives a mean stature of 146.0 cm. for males, 138.0 cm. for females. Number of subjects not given.
Chipaya	*Tupí*	18° S.-68° W.	1	----	145.5	----	----	72.80	Posnansky, 1918	2	1	----	Posnansky (1918) mentions that the Mongolian eye-fold is absent among these people.
Chiriguano	*Tupí*	21° S.-62° W.	44	10	163.1	151.7	54	81.98	Lehmann-Nitsche, 1908a	1	40	10	Outes and Bruch (1910) say these Indians are shorter than the neighboring *Toba*, who are described as tall, handsome, and very well-built.
Chocó	*Chorotegan*	8° N.-77° W.	10	9	156.4	145.3	19	80.49	Lehmann-Nitsche, 1908a; Hrdlička, 1926.	1	10	9	Hrdlička (1926) describes these people as being closely related to the *Nahua*-speaking Indians.
Chorotí	*Mataco*	22° S.-64° W.	20	10	161.6	155.3	30	77.67	Lehmann-Nitsche, 1908a	1	20	10	Pericot (1936) gives the mean male stature for the *Chorotí* as 163.5 cm. Karsten (1932) states they closely resemble the *Mataco*.
Conebo	*Panoan*	10° S.-74° W.	3	----	161.0	----	3	91.36	Farabee, 1922	1	3	----	Roquette-Pinto (1938) gives mean male stature as 147.0 cm.
Cumayena	*Carib*	3° N.-58° W.	3	3	160.8	140.9	6	80.70	Farabee, 1924	2	3	3	
Cuna	*Chibchan*	8° N.-78° W.	27	20	154.9	143.2	47	86.21	Hrdlička, 1926	1	27	20	Hrdlička (1926) says the *Cuna* are related to the *Maya* of Yucatan, since they are short, sturdy, round-headed, with receding forehead and convex nose.
Cunco	*Araucanian*	40° S.-73° W.	----	----	155.0	----	----	----	Pericot, 1936	3	----	----	Pericot (1936) says these Indians are mesocephalic and have large supraorbital ridges.
Diau	*Carib*	3° N.-58° W.	13	1	159.5	154.9	14	81.36	Farabee, 1924	1	13	1	
Galibí	*Carib*	6° N.-54° W.	9	5	159.4	145.8	14	79.81	Maurel, 1873	2	9	5	
Goajiro	*Arawakan*	12° N.-72° W.	24	11	150.9	143.8	35	80.66	G. Mason, 1940	2	24	11	
Guaraní	*Tupí*	26° S.-57° W.	6	3	153.0	142.7	9	81.70	Krone, 1906	1	6	3	Krone (1906) says they have a well-developed thorax; yellowish-brown skin color; eyes of various shades; coarse black hair, sometimes wavy.
Guayakí	*Tupí*	25° S.-57° W.	----	----	151.0	----	----	----	Vellard, 1934	3	----	----	151.0 cm. is the median of a 150.0-152.0 range cited by Vellard. Lehmann-Nitsche (1908a) gives 81.3 as cephalic index for one female.
Ipurina	*Arawakan*	10° S.-68° W.	8	1	158.7	----	10	83.70	Lehmann-Nitsche, 1908a	2	8	1	Roquette-Pinto (1938) gives only head measurements.
Machiguenga	*Arawakan*	12° S.-73° W.	19	----	161.0	----	19	78.99	Farabee, 1922	1	19	----	Farabee (1922) says their eyes are horizontal and black; nose straight, never aquiline; lips thin and straight; chin round and short.
		17° S.-63° W.	18	15	155.9	143.9	33	80.83	Ferris, 1921	1	18	15	
Macu	Independent	1° S.-66° W.	----	----	161.0	----	----	----	Pericot, 1936	3	----	----	
Macushí	*Carib*	4° N.-62° W.	42	28	156.8	146.3	70	82.48	Bastos d'Avila, 1937	1	3	6	In vol. 5 of Koch-Grünberg (1923) are excellent photographs of the Indians of N. Venezuela, including the *Macushí*.
									Farabee, 1924	1	33	16	
									Ten Kate, 1887	2	6	6	
Mapidian	*Arawakan*	3° N.-58° W.	10	9	161.5	148.8	2	80.15	Farabee, 1918	2	10	9	Mean span for males 170 cm., females 154 cm. Mean nasal index for males 84.4, females 80.5.
Mapuche	*Araucanian*	38° S.-73° W.	31	10	161.0	143.2	----	----	Latcham, 1909	3	31	19	

TABLE 1.—*Stature and cephalic index of 88 South American tribes, with source and evaluation of other anthropometric data*—Continued

Tribe	Linguistic group	Location	Stature (cm.)				Cephalic index [3]		Source	Rel.[4] value	No. of subjects		Remarks, general physical characteristics, and some additional anthropometry
			No.[1]		Means [2]		No.[1]	Mean [2]					
			♂	♀	♂	♀	♂ and ♀	♂ and ♀			♂	♀	
Mataco	Independent	25° S.–65° W.	30	20	163.8	152.9	50	77.98	Lehmann-Nitsche, 1908a	1	30	20	Karsten (1932) says the *Mataco*, like the *Chorotí* have hair that is long, black, and coarse. Their eyes are dark brown and their noses flat.
Maué	*Tupí*	3° S.–57° W.	----	----	158.0	----	----	----	Roquette-Pinto, 1938	2	----	----	
Mehinacú	*Arawakan*	13° S.–56° W.	6	6	164.0	151.2	12	77.74	Ehrenreich, 1897	2	6	6	Ehrenreich (1897) adds a bizygomatic breadth of 141 and 126 mm. for males and females, respectively. He says their eyes are small and horizontally set.
Miranha	*Tupí*	4° S.–75° W.	----	----	160.0	----	----	----	Roquette-Pinto, 1938	2	----	----	
Mundurucú	*Tupí*	4° S.–57° W.	----	----	160.0	----	----	----	Roquette-Pinto, 1938	2	----	----	Markham (1894–95) says they are strong, muscular, and broad-chested.
Mura	Independent	6° S.–63° W.	----	----	154.0	----	----	----	Roquette-Pinto, 1938	2	----	----	Markham (1894–95) describes them as tall, with beards. Their hair is coarse and wavy.
Nahucua	*Carib*	12° S.–55° W.	95	59	163.0	150.5	154	79.63	Bastos d'Avila, 1937	1	15	12	According to Eickstedt (1934), these Indians belong to the "Lagide" race, which has yellow-brown skin, small narrow eye slits, straight and sometimes concave noses, thick lips.
									Lehmann-Nitsche, 1908a	3	65	35	
Nambicuara	*Ge*	12° S.–58° W.	18	7	162.0	147.0	18	76.00	Lehmann-Nitsche, 1908a	2	18	7	Roquette-Pinto (1938) says their skin is light yellow; their hair straight, but sometimes wavy.
									Roquette-Pinto, 1938	----	----	----	
Omagua	*Tupí*	4° S.–74° W.	----	----	160.0	----	----	----	Roquette-Pinto, 1938	2	----	----	
Ona	Independent	54° S.–68° W.	85	108	174.3	159.3	112	79.39	Lehmann-Nitsche, 1908a	2	2	2	Lothrop (1928) gives Hooton's summary of the physical dimensions of the *Ona* and *Yahgan*, with probable errors. (See also this volume, p. 121.)
									Lehmann-Nitsche, 1908a	3	2	2	
									Lehmann-Nitsche, 1908a	2	20	30	
									Lehmann-Nitsche, 1908a	3	24	22	
									Lothrop, 1928	1	25	34	
									Outes, 1909	2	3	11	
									Lehmann-Nitsche, 1927	3	8	7	
									Lehmann-Nitsche, 1927	3	1	----	
Otavalo	*Quechua*	1° S.–78° W.	108	----	156.0	----	----	80.04	Gillin, 1941	1	108	----	A great deal of physical anthropology is presented in Gillin (1941).
Paressí	*Arawakan*	14° S.–59° W.	10	3	160.0	151.4	13	77.48	Roquette-Pinto, 1938	2	----	----	Roquette-Pinto (1938) says they have long trunks, short legs, small hands and feet, convex noses, dark brown eyes.
									Lehmann-Nitsche, 1908a	2	9	3	

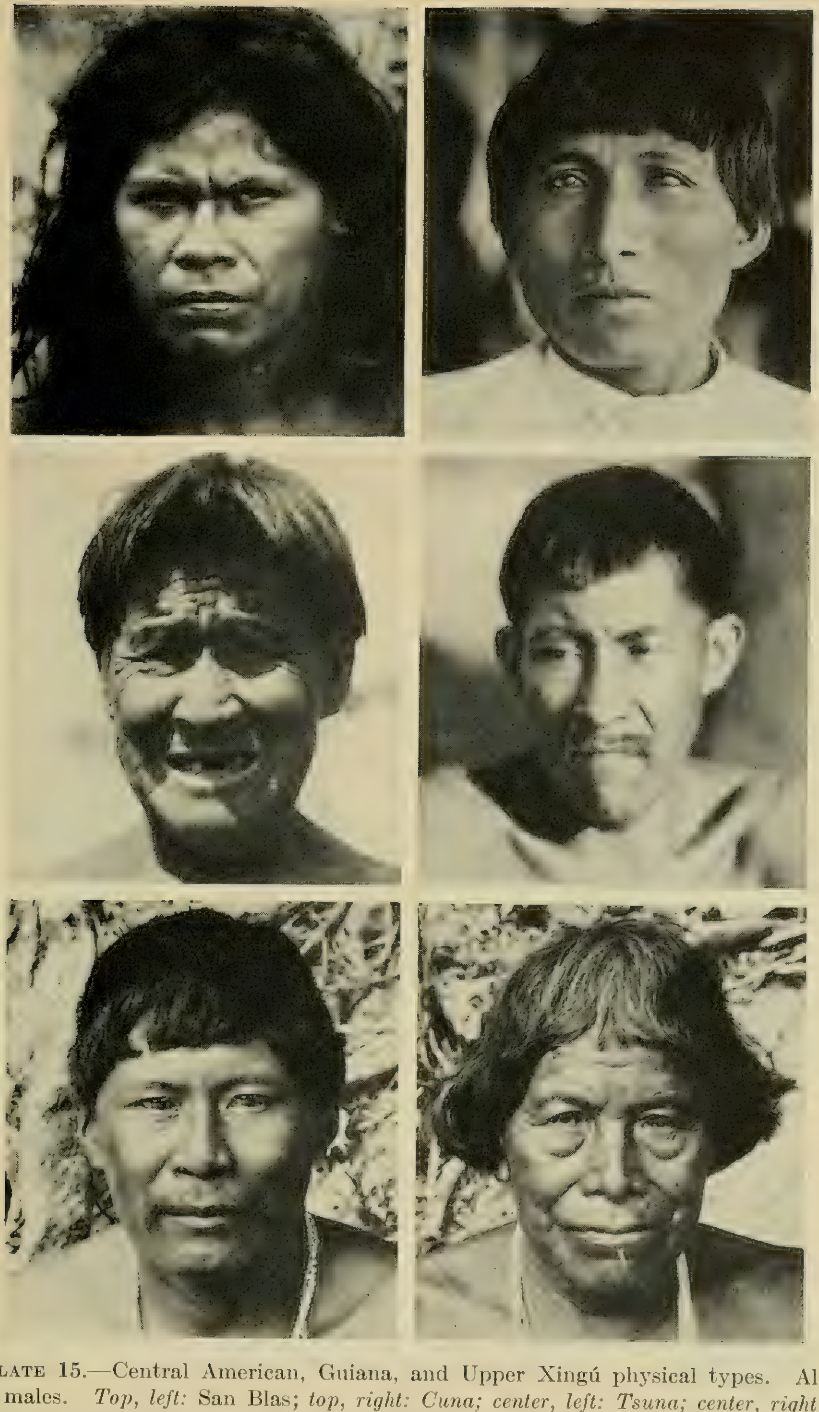


Plate 15.—Central American, Guiana, and Upper Xingú physical types. All males. *Top, left:* San Blas; *top, right: Cuna; center, left: Tsuna; center, right: Carib* (mixed?); *bottom, left: Atorai; bottom, right: Wapishana.* (Courtesy H. Armstrong Roberts; United States National Museum; University Museum, Philadelphia; the National Geographic Society; and, *bottom,* after American Journal of Physical Anthropology, vol. 1, p. 441.)

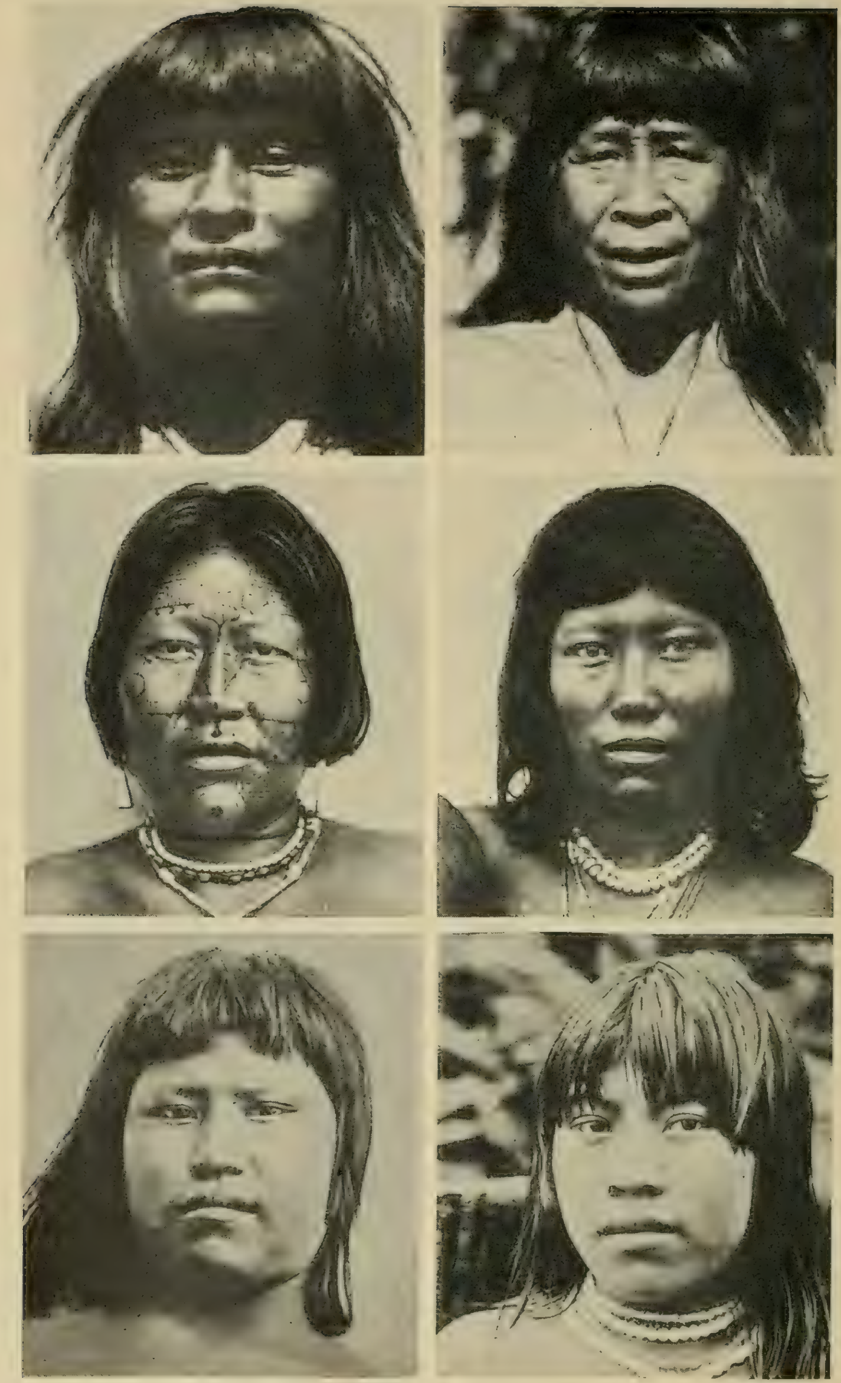


Plate 16.—Indians of the Upper Xingú and the Chaco. All females. *Top, left: Naravute; top, right: Calapalo; center, left: Caduveo; center, right, bottom, left,* and *bottom, right: Chamacoco.* (Courtesy University Museum, Philadelphia; after Lehmann-Nitsche, 1904, Nos. 23, 89, 74, 54.)

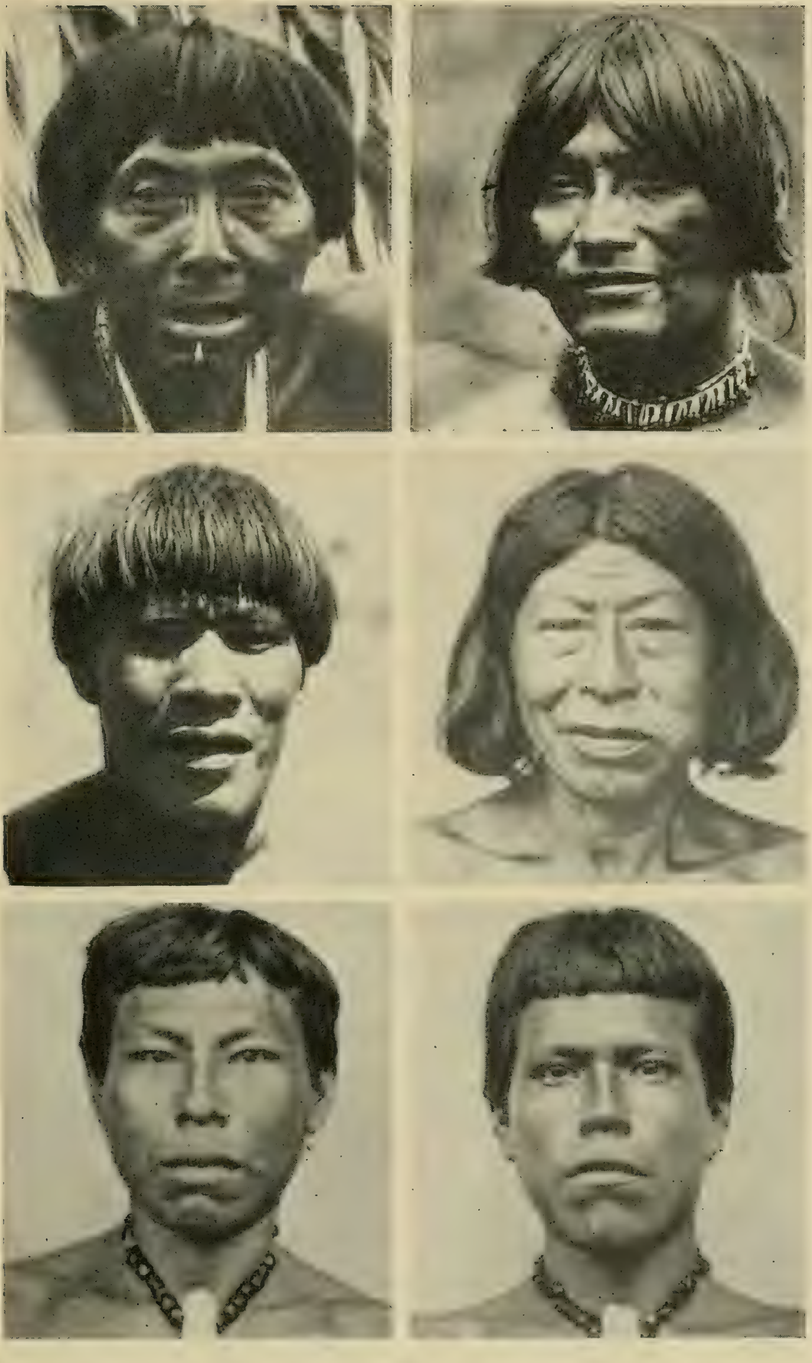


Plate 17.—Indians of the Guianas, Montaña, upper Xingú, and northwest Amazon. All males. *Top, left: Taruma; top, right: Jívaro; center, left: Calapalo; center, right, bottom, left,* and *bottom, right: Tuyuca.* (After Farabee, 1918, p. 441; courtesy N. E. Anthony; courtesy the University Museum, Philadelphia; and after Koch-Grünberg, 1906, pls. 29, 22.)

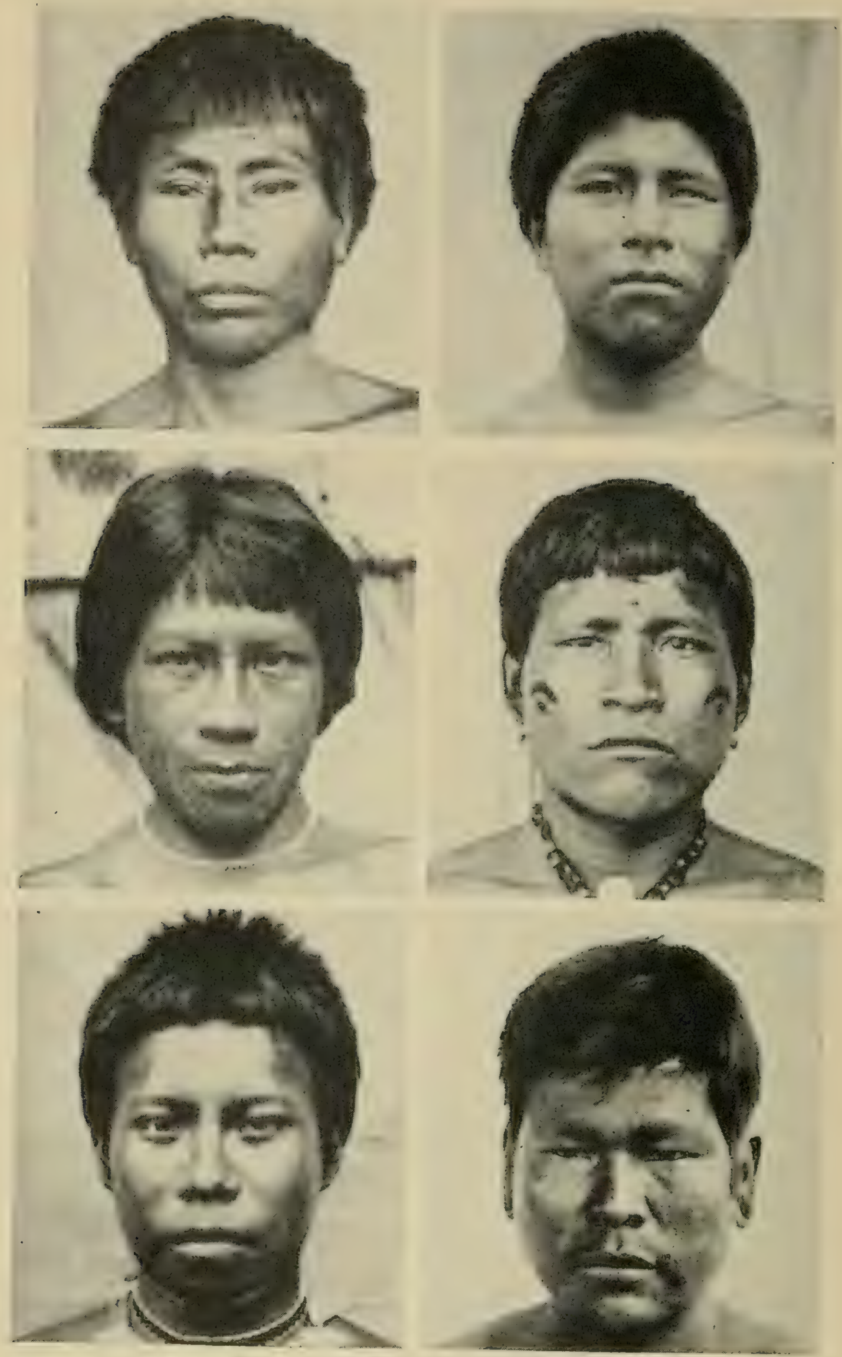


PLATE 18.—Indians of the northwest Amazon and the Chaco. All males. *Top, left: Desaná; top, right: Catapolitani; center, left: Caua; center, right: Tucano; bottom, left: Piratapuyo; bottom, right: Choroti.* (After Koch-Grünberg, 1906, pls. 62, 137, 115, 12, 57; and courtesy American Museum of Natural History.)

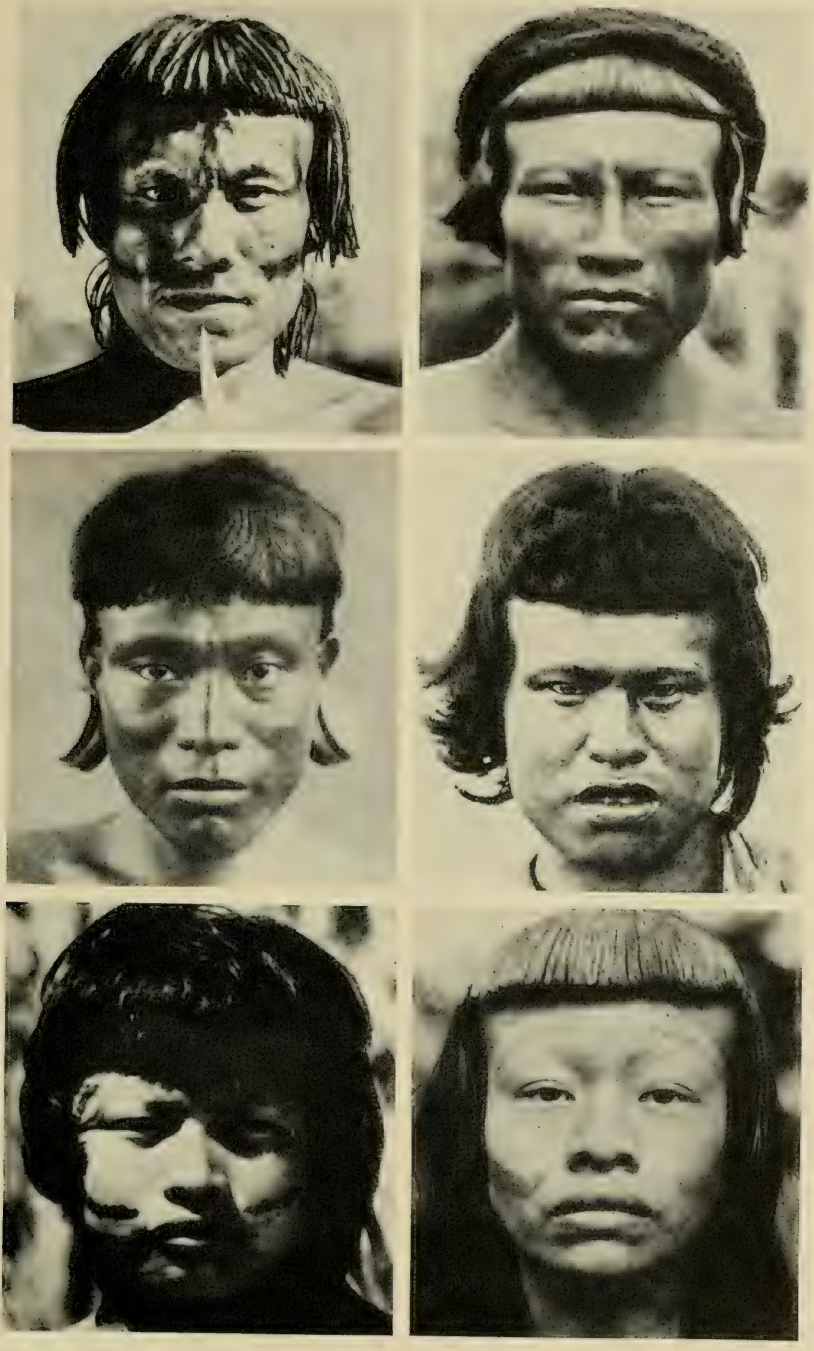


Plate 19.—Indians of the Mato Grosso and the Ecuadorean Montaña. *Top, left: Bororo* male; *top, right: Bororo* male; *center, left:* Napo River male; *center, right: Bororo* male; *bottom, left: Bororo* female; *bottom, right: Bororo* female. (Courtesy David M. Newell; courtesy the United States National Museum; and *center, right,* after Lehmann-Nitsche, 1904, No. 34.)

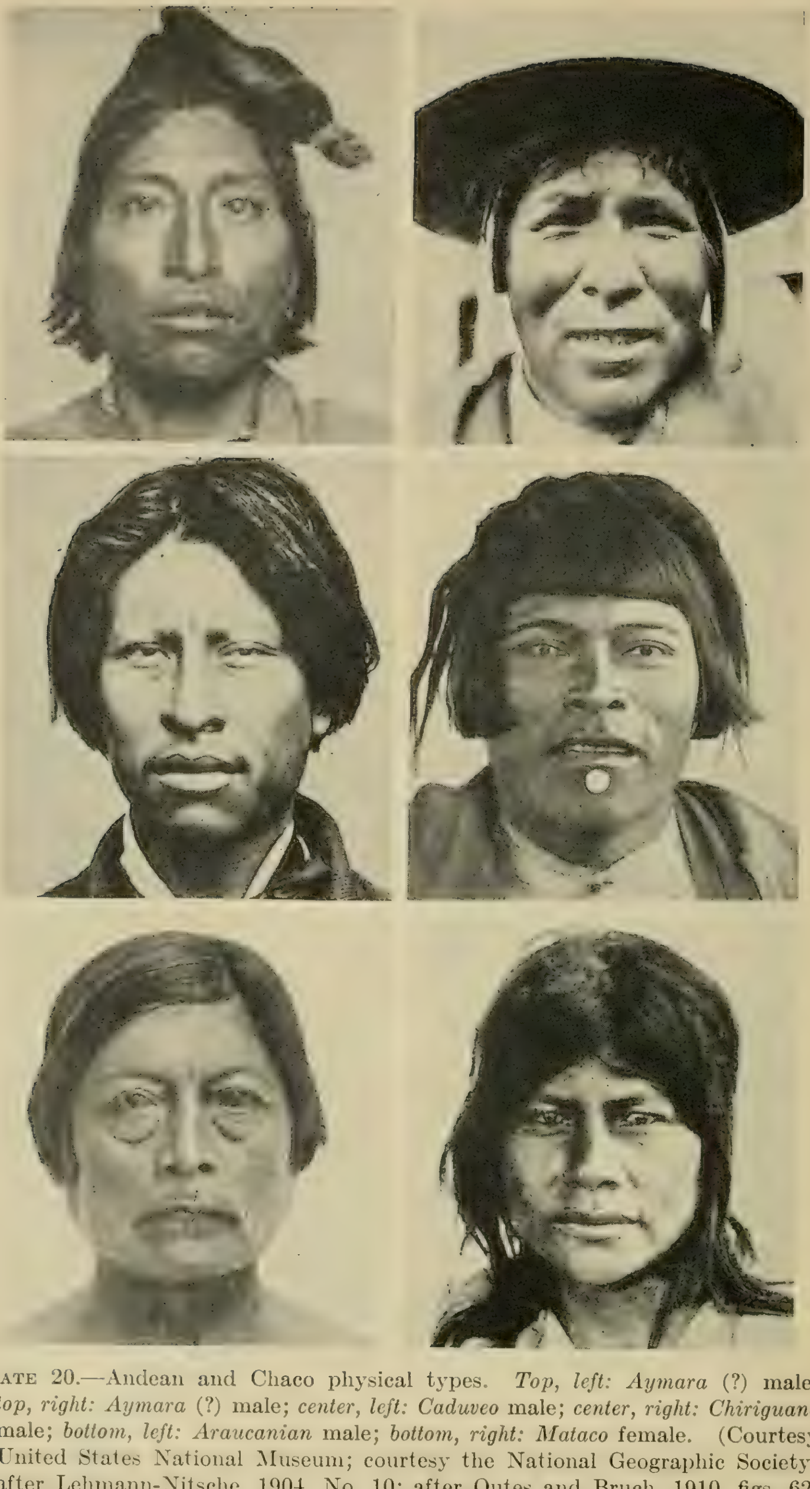


Plate 20.—Andean and Chaco physical types. *Top, left: Aymara* (?) male; *top, right: Aymara* (?) male; *center, left: Caduveo* male; *center, right: Chiriguano* male; *bottom, left: Araucanian* male; *bottom, right: Mataco* female. (Courtesy United States National Museum; courtesy the National Geographic Society; after Lehmann-Nitsche, 1904, No. 10; after Outes and Bruch, 1910, figs. 62, 93; and courtesy American Museum of Natural History.)

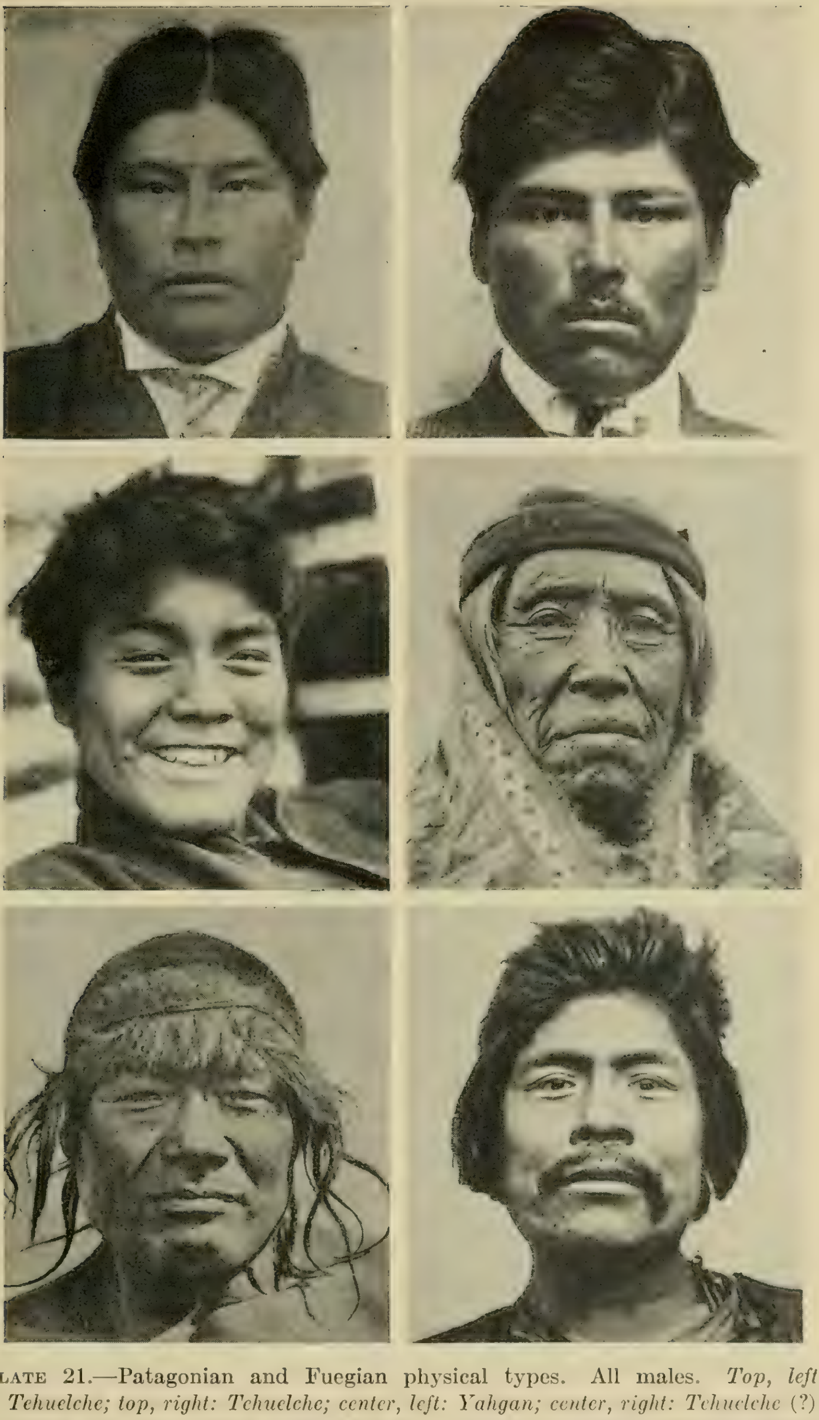


Plate 21.—Patagonian and Fuegian physical types. All males. *Top, left: Tehuelche; top, right: Tehuelche; center, left: Yahgan; center, right: Tehuelche* (?); *bottom, left: Ona; bottom, right: Yahgan.* (Courtesy Robert Lehmann-Nitsche through the United States National Museum; courtesy the National Geographic Society; after Outes and Bruch, 1910, fig. 109; after Lahille, 1926, pl. 4; and courtesy American Museum of Natural History.)

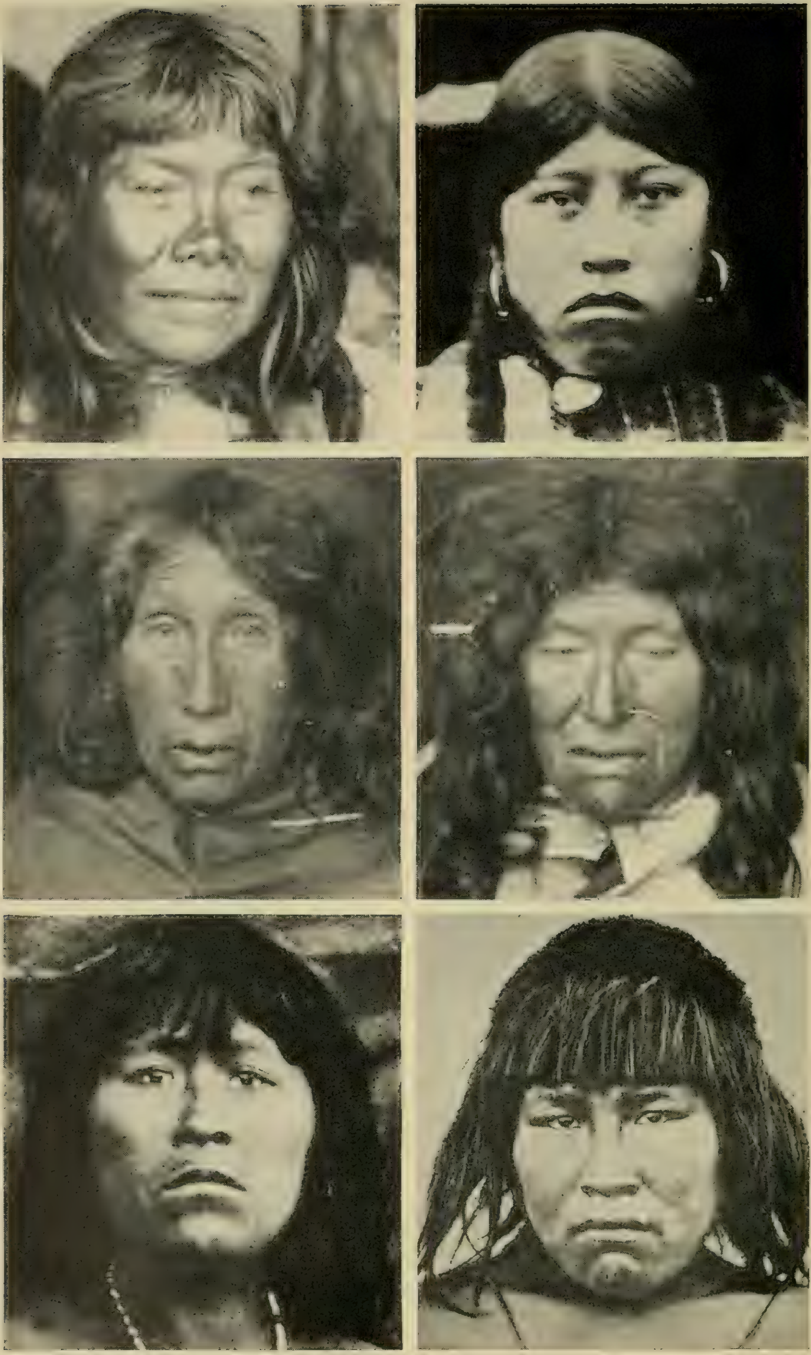


Plate 22.—Patagonian and Fuegian physical types. All females. *Top, left: Tehueiche; top, right: Tehuelche; center, left: Tehuelche* (mixed?); *center, right: Tehuelche* (mixed?); *bottom, left:* Fuegian; *bottom, right: Ona.* (Courtesy the National Geographic Society; courtesy the American Museum of Natural History; and after Lahille, 1926, pl. 4.)

Pariquí	Uncertain	3° S.–58° W.	----	----	155.0	-------	----	-------	Roquette-Pinto, 1938	2	-----	-----	
Parucutú	*Carib*	3° N.–63° W.	10	5	157.9	147.3	15	82.70	Farabee, 1924	1	10	5	
Paumarí	*Arawakan*	5° S.–64° W.	3	----	164.3	-------	----	83.80	Lehmann-Nitsche, 1908a	3	3	-----	Buschan (1922) says the *Paumarí* are very awkward and massive.
Pehuelche	*Araucanian*	35° S.–70° W.	----	----	169.0	-------	----	76.80	Latcham, 1909	3	-----	-----	Pericot (1936) says these people have a tendency to prognathism.
Piro	*Arawakan*	10° S.–73° W.	23	8	161.3	151.0	31	77.55	Farabee, 1922	2	23	8	
Purí	Independent	17° S.–42° W.	----	----	154.0	-------	----	-------	Roquette-Pinto, 1938	2	-----	-----	
Quechua	*Quechua*	14° S.–72° W.	446	77	158.7	146.3	523	80.79	Rouma, 1913	1	25	-----	Rouma's studies (1913) were made on two fincas: Finca de Potola, and Finca de Anfaya. Ferris (1921) adds that these Indians have broad shoulders, large trunks, short forearms and thighs. Eye color is maroon and greenish-yellow.
									Ferris, 1921	2	123	1	
									Ferris, 1921	1	85	68	
									Ferris, 1916	1	121	-----	
									Chervin, 1907	2	67	8	
Rama	*Chibchan*	12° N.–84° W.	25	----	166.1	-------	----	85.92	A. H. Schultz, 1926	1	25	1	
San Blas or *Tule*	*Chibchan*	9° N.–78° W.	14	5	149.9	140.4	19	85.22	Harris, 1926	1	14	5	In this group are many so-called White Indians, partial albinos. Feeney (1941) gives stature for a male and female of this group as 163 and 158 cm., respectively.
Setebo	*Panoan*	12° S.–70° W.	3	----	158.0	-------	----	90.41	Farabee, 1922	1	3	-----	
Shipibo	*Panoan*	12° S.–72° W.	14	----	156.8	-------	----	85.69	Farabee, 1922	1	14	-----	
Subandino	*Araucanian*	38° S.–72° W.	11	6	164.3	147.5	11	80.60	Latcham, 1909	3	11	6	
Sumo	*Sumo-Mosquito*	13° N.–84° W.	12	----	158.1	-------	----	89.48	A. H. Schultz, 1926	1	12	-----	
Takshik	*Guaikurú*	25° S.–60° W.	2	7	163.3	160.7	9	79.50	Lehmann-Nitsche, 1904e	3	2	7	Lehmann-Nitsche (1904e) gives many measurements on 12 *Takshik* children.
Tambopata	*Guarayo*	14° S.–69° W.	4	----	159.0	-------	----	-------	Nordenskiöld, 1905	3	4	-----	According to Nordenskiöld (1905), these Indians have light-brown skin and dark-brown hair.
Taruma	*Arawakan*	2° N.–57° W.	9	6	159.6	146.1	15	81.34	Farabee, 1918a	1	9	6	Farabee (1918a) says there were two women for every man in this group.
Tehuelche	Independent	45° S.–68° W.	9	1	176.0	168.0	7	88.20	Lehmann-Nitsche, 1916e	1	-----	-----	These Indians have been described by explorers as unusually tall. Serrano (1930) quotes Latcham as giving a mean stature of 180 cm. for the *Tehuelche.*
									Lehmann-Nitsche, 1908a	3	6	-----	
									Latcham, 1909	3	-----	-----	
									Dreising, 1883	2	1	-----	
Tembé	*Tupí*	2° S.–48° W.	8	----	151.4	-------	----	-------	Roquette-Pinto, 1938	2	-----	-----	
									Lopes, 1932	3	7	-----	
Tiatinagua	*Tupí*	14° S.–68° W.	4	----	158.5	-------	----	76.31	Farabee, 1922	1	4	-----	Farabee (1922) says they do not extract body or facial hair, and hence appear much more hairy than other tribes.
Tucuna	*Arawakan*	4° S.–71° W.	----	----	149.0	-------	----	-------	Roquette-Pinto, 1938	2	-----	-----	Markham (1894–95) says they are well-formed, that their faces are round and beardless, their noses thin and sharp, their skin dark.
Toba	*Guaikurú*	24° S.–60° W.	20	10	169.8	155.5	----	78.90	Lehmann-Nitsche, 1908a	3	20	10	Moring (1892) says that the *Toba* are the largest of the *Chaco* tribes.
Trumaí	Independent	12° S.–54° W.	22	14	159.4	148.8	36	82.22	Lehmann-Nitsche, 1908a	3	14	14	Dimensions quoted by Lehmann-Nitsche (1908a) from Ranke and Ehrenreich.
Umaua	*Carib*	0–73° W.	2	----	153.7	-------	----	82.30	Bastos d'Avila, 1937	1	2	-----	Koch-Grünberg (1908c) says the *Umaua* deform the heads of their children.

TABLE 1.—*Stature and cephalic index of 88 South American tribes, with source and evaluation of other anthropometric data*—Continued

Tribe	Linguistic group	Location	Stature (cm.)				Cephalic index[3]		Source	Rel.[4] value	No. of subjects		Remarks, general physical characteristics, and some additional anthropometry
			No.[1]		Means[2]		No.[1]	Mean[2]					
			♂	♀	♂	♀	♂ and ♀	♂ and ♀			♂	♀	
Uro	Independent	17° S.–68° W.	----	----	-------	-------	6	80. 98	Posnansky, 1937	3	4	2	Polo (1901) states that they are of medium stature—140–150 cm. They have well-developed hands and feet, wide foreheads, salient cheekbones, and dark skin.
Urucuena	*Carib*	2° N.–54° W.	2	2	157. 9	143. 7	4	83. 25	Farabee, 1924	2	2	2	
Waiwai	*Carib*	1° N.–58° W.	40	12	158. 9	146. 3	42	81. 06	Farabee, 1924	1	36	10	Holden (1938) gives mean blood pressures for this group: systolic 121, and diastolic 74.
Wapishana	*Arawakan*	4° N.–61° W.	13	6	158. 9	151. 4	19	79. 09	Bastos d'Avila, 1937	1	4	6	Bastos d'Avila (1937) says these Guiana Indians are the shortest of all the *Arawak.* Farabee (1918a) states that there were about 1,200 people in this tribe.
									Farabee, 1918	1	9	-----	
Witoto	Independent	2° S.–72° W.	5	4	162. 0	146. 8	5	77. 43	Farabee, 1922	1	5	4	
Yahgan	Independent	56° S.–72° W.	450	315	158. 3	148. 3	154	79. 25	Hyades and Deniker, 1882–83.	2	26	23	In Lothrop's study (1928), Hooton made a statistical review of the physical features of the *Yahgan.* According to Gusinde (1931–37), the skin color is yellowish-brown, the head hair thick, black, and straight, and the body hair scant. Eye color ranges from hazel to black. (See also this volume, p. 124.)
									Lehmann-Nitsche, 1908a	3	67	55	
									Lehmann-Nitsche, 1916c	2	1	-----	
									Lothrop, 1928	1	67	56	
									Virchow, 1881	2	6	-----	
									Gusinde, 1931–37	3	14	19	
									Pericot, 1936	2	269	160	
									Latcham, 1909	3	-----	-----	
Yamamadi	*Arawakan*	7° S.–67° W.	4	----	159. 8	-------	----	81. 80	Lehmann-Nitsche, 1908a	3	4	-----	Lehmann-Nitsche (1908a) quotes Ehrenreich as saying that the *Yamamadi* have coarse, straight, brown hair.
Yaruro	Independent	7° N.–67° W.	19	21	160. 0	148. 3	40	80. 63	Petrullo, 1939	2	7	9	
										2	4	5	
										2	8	7	

[1] Total number of subjects used in computing mean.

[2] Weighted mean computed from means of various investigators. Where number of subjects was not given, the group was considered as a unit of one.

[3] Male and female data combined.

[4] Signifies relative anthropometric value of each reference, scaled as follows: 1=references with 10 or more dimensions given; 2=references with less than 10 dimensions, but more than stature and cephalic index alone; 3=references with stature and cephalic index only.

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ANTHROPOMETRY OF THE INDIANS OF BRAZIL

By José Bastos d'Avila

INTRODUCTION

The founding of the Museu Nacional in Brazil in 1818 marked the beginning of the anthropological study of the Indians who inhabited the jungle and forests of Brazil. In 1842, this study was further advanced by the establishment in this museum of the Secção de Numismática, Artes Liberais, Arqueología, Usos e Costumes das Nações Antigas e Modernas. The archives and publications of this century-old institution comprise the first documents on the anthropometry of the Brazilian Indian. Special attention should be called to the remarkable studies made by Rodrigues Peixoto and J. B. de Lacerda (1876) on skulls and other material recovered from kitchen-middens (sambaquís) of the coast and from caves in the interior of the country, and also to the work of Barbosa Rodrigues (1882), one of the first to become interested in the living Indian. Later, travel notes of foreign and Brazilian naturalists contributed to the considerable body of knowledge on the anthropometry of the American Indian in Brazil. Unfortunately, many of the Indian tribes, especially those along the coast, were already extinct when the anthropometric studies began.

A survey of the material impresses us not so much by its meagerness as by the lack of a fundamental criterion to serve as a basis for the organization of data already collected and as a guide to collecting further data. In short, we lack an adequate classification of the South American Indians.

Praiseworthy attempts at classification have been advanced, such as the one by Alcide d'Orbigny (1839), which, though at first ignored, is now better understood in terms not only of its main classification but of the premises upon which it is based. D'Orbigny recognized three great racial groups in South America: (1) Andine-Peruvian; (2) Pampean; (3) Brazilian-*Guaraní*. His third group, the Brazilian-*Guaraní,* is the only one that includes Brazilian Indians, and it embraces only one of Brazil's Indian groups, excluding many others, which do not fit in with D'Orbigny's classification.

Language has been the criterion for other classifications (this volume, p. 157), but these classifications do not wholly coincide with physical type. Similarly, the Indians have been classed on a regional basis, as in volumes 1 to 4 of the Handbook. In the present treatment of the anthropometry of Brazil, we use divisions which are regional, linguistic, and tribal. The correspondence between environment, culture, and physical type is by no means complete; but it does suggest certain historical reconstructions.

The subsequent tabulations of anthropometric data are by linguistic families and tribes. As these tribes have been described in detail in previous volumes and as they are located on the tribal and linguistic map in the present volume, only minimal information is herein given on their culture and their native and present location; cross-references are made to the other volumes of the Handbook where the tribes are treated in full.

The regions of Brazil.—If we glance at a map of Brazil, we shall see that its vast territory falls into four regions according to elevation. Two of the regions can be considered as lowland, with a maximum altitude of about 60 feet (about 200 m.); two others as plateaus, with altitudes from 30 to 150 feet (about 100 to 500 m.). The Amazon and La Plata Basins in their Brazilian reaches, that is along the Paraguay, Paraná, and Uruguay Rivers, belong among the lowlands. The Coast of Brazil to a minimum depth of 45 miles (15 leagues) should also be included among the lowlands. This border, which in the south communicates with the La Plata Basin, strikes deeper inland toward the Equator and finally merges with the Amazon Basin. Guiana and the Eastern Plateau of Brazil form the highlands, connected by the Central massif, which separates the Amazon and São Francisco Basins on one side and the São Francisco and La Plata Basins on the other.

THE DISTRIBUTION OF ANTHROPOMETRIC TYPES

What peoples have inhabited these four regions of Brazil?

The Portuguese, on their arrival in Brazil, found the *Tupí-Guaraní* Indians on the coast. Later observations showed that the *Tupí-Guaraní* tribes, called by various names, occupied the whole of the coastal strip, the Paraná and Paraguay Basins, and extensive regions in the Amazon Basin. In other words, they completely surrounded the Central-Eastern Plateau, into which they were gradually penetrating. In the Brazilian Guiana two groups were found, the *Carib* and the *Arawak*. Both had more or less well-populated nuclei on the right margin of the Amazon River. The Central-Eastern Plateau, a refuge area, was chiefly occupied by the *Ge* tribes which had perhaps been driven from the richer lowlands by more advanced and bellicose peoples.

When the subject is thus stated, it seems simple. It is difficult, however, if not impossible, to fit some of the tribes into this classification without mentioning the prehistoric and extinct tribes, traces of which are found in kitchen middens of the coast and in limestone caves in the interior of Brazil.

The skulls found in the kitchen middens of the southeastern part of Brazil (Handbook, vol. 1, p. 401), to which Eickstedt ascribes an even more remote antiquity than that of the Lagoa Santa Man (Handbook, vol. 1, p. 399). are, according to the exhaustive studies of J. B. de Lacerda (1885), characterized by dolichocephaly, low and retreating brows, wide, coarsely molded faces, square jaws, and teeth much worn by use. As Virchow noted (1872 a), these skulls should not be confused with those found in later strata, for the latter are definitely brachycephalic and probably belong to members of the great *Tupí-Guaraní* linguistic family.

The "Man of Lagoa Santa" (pl. 23), exhumed by Lund in the caves of Rio das Velhas, resembles the "Man of the Sambaquís" but differs from him mainly in a greater height of the skull, which when examined from the front has a typically pyramidal shape.

The Central-Eastern Plateau of Brazil.—The Lácida, our name for the "Man of the Lagoa Santa," is thought to have been the first inhabitant of Brazil and perhaps of South America. His fossilized remains were exhumed from the limestone caves of Rio das Velhas by Lund, and were studied by Søren Hansen in Copenhagen and in 1938 by Hella Pöch, who compared them with fossilized findings from Fontezuelas (Argentina).

After the Lácida, other more warlike and perhaps more cultured peoples may have come to Brazil dominating the first inhabitants, partly annihilating them and partly mixing with them, but, in any case, forcing them to take refuge in the regions of the Central-Eastern Plateau.

The "*Tapuya*" of the northeast and numerous groups of *Ge* as well as the southeastern *Botocudo* would thus be near relatives of the Lácida but not their direct descendants. The same could be said of the natives of the massif of Mato Grosso and of the banks of the Xingú and Araguaya Rivers, and of the *Bacaïri*, *Nahukwa*, *Carajá*, *Cayapó*, *Auetö*, *Suya*, *Bororo*, and many other tribes, in whom characteristic traces betray the primitive Lácida race.

The anthropometric data, appearing in table 1, refer to the skulls of the Lagoa Santa man, including the only one sent directly by Lund to the Instituto Historico e Geographico do Rio de Janeiro (the first of the series). Although the most important measurements have already been published (Lacerda and Rodrigues Peixoto, 1876), we believe it pertinent to reproduce them here, with the addition of others, because the skull in question appears to have been a woman's and not a man's, as was first stated, and because comparisons may be more easily made with the hitherto unpublished data given below. The latter data refer to skulls belonging to the collection of the Museu Nacional, of which those numbered 20937, 20938, 20939, and 20982 were exhumed by the naturalist Padberg Drenkpoll from the "Lapa Mortuaria," later called "Confins"; those numbered 21238 and 21239 were taken from the "Lapa do Caetano" and given to Drenkpoll; and those numbered 629 and 630 were taken from "Lapa de Carrancas" and brought by us to Rio de Janeiro.

Table 1.—*Craniometric measurements and indices of Lagoa Santa skulls*

Craniometric measurements (mm.) and indices	Skull female H. G.	Calotte No. 20937	Skull male No. 20938	Skull female No. 20939	Skull female No. 20982	Calotte No. 21238	Skull male No. 21239	Skull male No. 629	Skull male No. 630
Diam. anteroposterior max	18. 5	17. 6	18. 1	17. 2	17. 7	19. 0	18. 9	18. 3	18. 8
Diam. glabella-inion	18. 4	--------	17. 8	17. 1	17. 4	18. 0	18. 3	17. 7	--------
Diam. glabella-lambda	18. 1	17. 0	--------	16. 4	16. 7	18. 1	18. 1	17. 5	18. 0
Diam. basion-nasion	9. 3	--------	10. 7	9. 4	9. 5	--------	10. 5	10. 1	10. 2
Diam. basion-opisthion	3. 9	--------	3. 3	3. 3	3. 3	--------	--------	--------	3. 5
Diam. transverse max	13. 0	13. 3	13. 3	12. 8	11. 8	13. 3	13. 3	13. 6	13. 5
Diam. frontal min	9. 2	9. 3	9. 9	8. 5	8. 6	9. 0	10. 0	9. 7	9. 2
Diam. frontal max	10. 8	10. 7	10. 7	10. 6	10. 2	--------	--------	--------	11. 4
Diam. biauricular	12. 2	--------	12. 2	11. 0	11. 5	--------	13. 1	13. 0	12. 2
Diam. bioccipital max	11. 4	--------	10. 7	10. 4	10. 0	--------	--------	--------	--------
Diam. bimastoid	9. 9	--------	10. 7	9. 1	9. 8	--------	10. 5	10. 7	10. 5
Diam. basion-bregma	13. 3	--------	13. 7	12. 7	13. 1	--------	12. 8	13. 7	13. 6
Height auricular bregma	11. 2	--------	12. 5	10. 7	10. 7	--------	10. 8	8. 9	8. 2
Circumference horizontal	50. 1	51. 5	50. 8	47. 8	49. 4	--------	52. 5	51. 3	52. 4
Arc transverse	30. 2	--------	30. 1	29. 2	28. 3	--------	28. 0	30. 0	31. 1
Arc median sagittal	38. 1	--------	--------	35. 1	35. 8	--------	--------	--------	38. 8
Arc frontal sagittal	13. 0	11. 8	--------	11. 6	12. 3	12. 1	12. 3	12. 0	12. 5
Arc parietal sagittal	13. 7	13. 0	--------	13. 0	12. 4	13. 2	12. 4	12. 3	13. 9
Arc occipital sagittal	11. 4	--------	--------	10. 7	11. 1	--------	--------	--------	12. 2
Chord median frontal sagittal	11. 1	10. 6	--------	10. 3	10. 7	11. 6	10. 9	10. 9	11. 3
Chord median parietal sagittal	12. 2	11. 1	--------	11. 2	11. 0	11. 6	11. 1	11. 0	12. 1
Chord median occipital sagittal	9. 8	--------	--------	9. 8	9. 3	--------	--------	--------	9. 9
Length of face	8. 8	--------	10. 7	--------	9. 1	--------	10. 5	10. 0	10. 0
Superior facial height	10. 5	--------	--------	--------	10. 3	--------	11. 2	10. 6	10. 9
Biorbital breadth	9. 6	--------	--------	--------	9. 6	--------	--------	9. 9	10. 0
Bizygomatic breadth	12. 2	--------	--------	--------	10. 6	--------	--------	15. 4	--------
Mean facial breadth	9. 6	--------	--------	--------	10. 4	--------	--------	--------	10. 3
Superior facial height	5. 5	--------	6. 1	--------	5. 6	--------	--------	6. 6	5. 9
Breadth of nasal base	2. 5	--------	2. 3	--------	2. 0	--------	2. 1	2. 4	2. 4
Breadth of orbit	4. 1	--------	3. 8	--------	3. 8	--------	4. 3	--------	3. 8
Height of orbit	3. 5	--------	3. 2	--------	3. 2	--------	3. 5	3. 4	2. 9
Breadth of nose	2. 2	--------	2. 5	--------	2. 1	--------	--------	--------	2. 3
Height of nose	4. 6	--------	5. 7	--------	4. 4	--------	5. 0	5. 4	4. 3
Length-breadth index	70. 2	75. 5	73. 4	74. 4	67. 8	70. 0	70. 3	74. 3	71. 8
Length-height index	71. 8	--------	75. 6	73. 8	74. 0	--------	67. 7	74. 8	72. 3
Breadth-height index	102. 3	--------	103. 0	99. 2	111. 0	--------	96. 2	100. 7	100. 7
Nasal index	47. 8	--------	43. 8	--------	47. 7	--------	--------	--------	53. 4
Angle of prognathism	65°	--------	74°	--------	70°	--------	--------	72°	74°

The "*Tapuya*" (Handbook, vol. 1, p. 553) and the numerous groups of *Ge* (Handbook, vol. 1, p. 477) are dolicho- and hypsicephalic, leptorrhine, and of short stature, generally less than 5 feet, 3 inches (1.60 m.).

The skulls of the *Botocudo* (Handbook, vol. 1, p. 531) are among the first South American Indian skulls to have been studied in Brazil and foreign countries. One, taken away by Prince Neuwied, appears in Blumenbach's "Decadas Crainiorum" (1790–1828, fig. 58) and in Morton's "Crania Americana" (1839, fig. 15). From the excellent study made by Lacerda and Rodrigues Peixoto (1876), we take the following anthropometric notes (table 2) referring to two *Botocudo* skeletons, one male and one female.

TABLE 2.—*Anthropometric measurements and indices of two* Botocudo *skeletons*

Measurements (mm.) and indices	Male	Female
Skull:		
Capacity (cc.)	1,515	1,230
Diam. anteroposterior max	18.6	17.4
Diam. transverse max	13.8	13.4
Diam. vertical	14.6	13.0
Diam. frontal min	8.8	8.7
Diam. frontal max	11.2	11.0
Diam. bizygomatic	14.4	12.5
Horizontal perimeter	34.5	31.0
Face height	13.0	10.6
Nose height	5.5	4.7
Nose breadth	2.5	2.3
Length-breadth index	73.0	77.0
Length-height index	78.4	74.7
Nasal index	45.4	48.9
Pelvis:		
Diam. bicristal	25.0	28.0
Diam. bi-iliac	21.0	25.0
Diam. sacro-pubic of the inlet	10.2	11.0
Diam. transverse of the inlet	12.2	13.5
Diam. oblique of the inlet	11.2	11.5
Diam. anteroposterior of the outlet	------------	12.5
Diam. bi-ischiatic of the outlet	9.5	11.0
Diam. bi-oblique of the outlet	------------	12.0
Long bones:		
Length of femur	39.0	43.0
Length of radius	21.0	26.0
Length of ulna	23.0	28.0
Length of humerus	28.0	32.0
Length of clavicle	14.2	16.5
Angle of neck of femur with diaphysis	130°	135°

The *Nambicuara* (Handbook, vol. 3, p. 361) were discovered by General Rondón in 1907 and described anthropometrically and ethnographically by Professor Roquette-Pinto in "Rondonia" (1935). The anthropometric data from "Rondonia" transcribed in table 3 refer to male *Nambicuara*.

TABLE 3.—*Anthropometric data on 18 male* Nambicuara (*from Roquette-Pinto, 1935*)

Measurements (mm.) and indices	Mean value
Stature (cm.)	162.0
Thoracic perimeter	81.0
Head:	
Diam. anteroposterior	18.4
Diam. transverse	14.0
Diam. frontal minimum	9.9
Diam. bizygomatic	13.4
Cephalic index	76.0
Nose:	
Height	4.7
Breadth	4.0
Nasal index	85.0
Ears:	
Length	6.0
Breadth	3.9

According to the data of table 3, the *Nambicuara* are of short stature, dolichocephalic and platyrrhine, and, as most of them have generally very low foreheads, probably chamecephalic, thus approximating the Australoid type. It is not unreasonable, therefore, to consider them related to the Lácidas.

The *Carajá* (Handbook, vol. 3, p. 179) are pronouncedly dolichocephalic, have high cheekbones and long forearms, and show considerable differences between the sexes, notably the shorter legs of the women. Paul Ehrenreich (1897 a) had the opportunity of examining 12 male and 9 female *Carajá*. We are indebted to him for the anthropometric notes cited in table 4.

TABLE 4.—*Anthropometric measurements and indices of 21* Carajá

Measurements (mm.) and indices	Male 12	Female 9
Stature (cm.)	168.9	152.7
Thoracic perimeter	93.0	85.0
Head:		
Diam. anteroposterior max	19.1	17.9
Diam. transverse max	14.2	14.1
Auricular height	12.8	12.1
Horizontal perimeter	55.6	52.9
Length-breadth index	74.3	78.7
Length-height index	67.0	67.5
Nose:		
Height	4.8	4.3
Breadth	4.1	3.6
Nasal index	85.3	83.7

Ehrenreich placed the *Carajá* in an unclassified group. However, from the anthropometric point of view, they do not differ greatly from the *Ge* groups, among which Karl von den Steinen rightly classified them.

The *Suya* (Handbook, vol. 3, p. 323) of the upper Xingú River were long considered the most westerly *Ge* tribe. They were first seen by Karl von den Steinen on his expedition through the interior of Brazil in 1884. As they were shy and uncooperative and would not allow their anthropometrical measurements to be taken, they were classified among the *Ge* tribes, on the basis of their language.

To the same group belong the *Shavante*, between the Araguaya and Tocantins Rivers; the *Apinaye*, in the angle formed by the two rivers; the *Sherente* and *Craho*, on the west bank of the Tocantins River. These as well as many other tribes of the Eastern Plateau which were known under the general designation of "*Tapuya*" either have become extinct or have disappeared by miscegenation (Handbook, vol. 1, passim). The anthropometric data on five *Cayapó* men, two *Cayapó* women, and one *Sherente*, which form table 5, are transcribed from Ehrenreich's book.

TABLE 5.—*Anthropometric data on five* Cayapó *men, two* Cayapó *women, and one* Sherente *(from Ehrenreich, 1897 a)*

Measurements (mm.) and indices	Male (6) and female (2)
Stature (cm.)	168.0
Thoracic perimeter	91.5
Head:	
Diam. anteroposterior max	18.4
Diam. transverse max	13.8
Auricular height	12.9
Horizontal perimeter	54.2
Length-breadth index	75.0
Length-height index	70.1
Nose:	
Height of nose	4.7
Breadth of nose	3.6
Nasal index	.0

The *Bororo* (Handbook, vol. 1, p. 419), the tallest Indians of the intertropical zone, living in and wandering over the endless plateaus of Mato Grosso and Goiás, along the Araguaya River, and as far south as the Paraná River at its confluence with the Paraguay River, and the *Southern Cayapó*, at the headwaters of the Araguaya River, present great difficulties. Both tribes are brachycephalic; the *Bororo* speak an isolated language, the *Cayapó* belong to the *Ge* family. Both differ from the dolichocephalic groups to which we have referred and both doubtless represent a later migration, the *Bororo* having kept their own language and the *Cayapó* having adopted that of the *Ge*, with whom they came into contact. The anthropometric data cited in tables 6 and 7 are from Ehrenreich.

TABLE 6.—*Anthropometric data on 26* Bororo *(from Ehrenreich, 1897 a)*

Measurements (mm.) and indices	Males (20)	Females (6)
Stature (cm.)	173.6	160.5
Thoracic perimeter	95.3	82.4
Head:		
Diam. anteroposterior max	18.5	18.3
Diam. transverse max	15.4	14.2
Auricular height	12.9	12.1
Horizontal perimeter	56.6	53.7
Length-breadth index	81.2	77.4
Length-height index	68.1	66.2
Face:		
Morphological height of face	12.0	10.6
Bizygomatic diameter	14.2	13.3
Morphological face index	84.5	79.6
Nose:		
Height of nose	5.0	4.4
Breadth of nose	4.2	3.6
Nasal index	84.5	79.6

TABLE 7.—*Anthropometric data on seven* Cayapó *(from Ehrenreich, 1897 a)*

Measurements (mm.) and indices	Males (5)	Females (2)
Stature (cm.)	167.6	154.5
Thoracic perimeter	89.6	
Head:		
Diam. anteroposterior max	17.3	17.5
Diam. transverse max	14.5	14.5
Auricular height	12.1	12.2
Horizontal perimeter	53.0	
Length-breadth index	83.8	82.8
Length-height index	69.9	69.7
Nose:		
Height	4.5	4.1
Breadth	3.7	3.5
Nasal index	82.2	83.7

Brazilian Guiana.—The *Arawak* and *Carib* (Handbook, vols. 3 and 4, passim) shared the Guianas, a region covered by Tropical Forests and cut by rivers having a plentiful supply of fish. Everything indicates that the *Arawak* preceded the *Carib* there.

Karl von den Steinen believes there were two different *Arawakan* linguistic groups: (1) The "*Nu-Aruaques,*" which occupy a vast region extending south to north from Bolivia through Mato Grosso and the Amazon Basin to Venezuela; and (2) the "*Aruaques proper.*" These groups probably had a common origin and at the beginning of the 17th century both lived on the Atlantic Coast, north of the mouth of the Amazon River and in the Lesser Antilles. Only the first is of interest to Brazil.

The *Carib* may have started from the southern bank of the Amazon River, perhaps along the headwaters of the Madeira and Tapajóz Rivers, and passed downstream to Brazilian Guiana, driving out or isolating the *Arawak.*

Arawak.—The *Arawak* are widespread in America. (See tribal map.)

According to data collected by João Braulino de Cavalho in 1938, the northernmost in Brazil are the *Wapishana* and *Aturai,* who are completely isolated in *Carib* territory. During the last century, the *Wapishana* lived in the forests between the Essequibo River and Rio Branco, between lat. 2° and 3° N. The *Aturai* originally inhabited the territory between the headwaters of the Rapunini and Cunduvini Rivers, tributaries of the Essequibo River. *Aturai* groups are still extant in Brazil, distributed along the margins of the Rio Tocutú, tributary of the Rio Branco.

The southernmost *Arawak* are the *Guaná* on the left margin of the Paraguay River near Cuyabá, the *Paressí* near the source of the Tapajóz River, and the *Custenau, Mehinacu,* and *Waurá* on the upper Xingú River.

In the west the *Paumarí, Yamamadí,* and *Ipurina* were studied by Ehrenreich on his expedition along the Purús River. The *Canamari* live on the headwaters of the Purús River. On the banks of the Juruá and Jataí Rivers are, respectively, the *Maraua* and *Abaicu.* It is, however, on the left bank of the Amazon River, along the Negro, Japurá, and Içá Rivers, that the *Arawak* family is chiefly gathered, especially the *Baniwa, Tariana, Baré,* and *Manáos* on the Rio Negro and the *Jacuna, Passé, Cauishana,* etc., on the Japurá and Içá Rivers (see Handbook, vol. 3, maps 2 and 5, and this vol, tribal map).

Anthropometric data on the various groups of the large *Arawak* family are meager; we summarize them in table 8.

TABLE 8.—*Anthropometric data on various groups of the* Arawak *family*

Source	Groups	Number	Stature	Thoracic perimeter	Diam. antero-posterior max.	Diam. transverse max.	Auricular height	Head: Horizontal perimeter	Horizontal cephalic index	Vertical cephalic index	Nose height	Nose breadth	Nasal index
		Males											
Ehrenreich	*Mehinacú*	6	164.1	95.1	18.5	14.4	12.2	55.4	77.8	65.9	4.7	4.1	87.2
Ehrenreich	*Waura*	1	165.7	94.0	19.0	14.7	12.5	56.8	77.3	65.7	5.2	3.8	73.0
Ehrenreich	*Yamamadí*	4	159.8	89.0	17.8	14.6	12.0	53.5	82.0	76.4	4.6	3.9	84.7
Ehrenreich	*Paumari*	3	164.3	------	18.1	15.2	12.7	------	83.9	70.1	------	------	------
Ehrenreich	*Ipurina*	9	158.7	86.0	18.0	15.1	12.2	------	83.8	67.7	5.0	3.7	74.0
Ehrenreich	*Paressí*	9	160.5	88.9	18.8	14.6	11.8	55.4	77.6	62.7	4.9	3.9	79.5
R.-Pinto	*Paressí*	5	155.0	83.0	17.6	14.4	------	------	81.8	------	5.3	3.8	71.7
Braulino de Carvalho.	*Baré*	1	154.5	88.0	17.3	14.3	13.0	52.0	82.6	75.1	------	------	------
Braulino de Carvalho.	*Wapishana*	4	162.6	87.2	18.8	14.5	12.2	54.0	77.4	64.8	------	------	75.7
Braulino de Carvalho.	*Aturai*	4	159.2	89.0	18.7	14.7	12.4	52.7	78.3	66.3	------	------	71.4
Von den Steinen	*Custenau*	2	158.5	------	18.9	15.4	------	56.2	81.1	------	5.2	3.4	65.3
		Females											
Ehrenreich	*Mehinacú*	6	151.2	83.6	17.7	13.8	11.6	------	77.9	65.5	------	------	------
Ehrenreich	*Waura*	1	147.5	79.0	17.3	14.7	12.7	48.7	84.9	73.4	4.4	3.4	77.2
Ehrenreich	*Yamamadí*	----	------	------	------	------	------	------	------	------	------	------	------
Ehrenreich	*Paumari*	----	------	------	------	------	------	------	------	------	------	------	------
Ehrenreich	*Ipurina*	----	------	------	------	------	------	------	------	------	------	------	------
Ehrenreich	*Paressí*	3	151.3	83.0	18.2	13.9	11.4	54.5	76.3	62.6	4.1	3.7	90.2
R.-Pinto	*Paressí*	----	------	------	------	------	------	------	------	------	------	------	------
Braulino de Carvalho.	*Baré*	----	------	------	------	------	------	------	------	------	------	------	------
Braulino de Carvalho.	*Wapishana*	6	151.4	85.8	17.8	14.7	12.4	52.7	80.0	69.6	------	------	64.8
Braulino de Carvalho.	*Aturai*	4	142.5	85.0	17.4	14.6	12.1	52.5	83.8	69.5	------	------	68.8
Von den Steinen	*Custenau*	1	143.0	------	17.6	14.3	------	54.4	81.2	------	5.1	3.6	70.5

Measurements of the *Arawak* show an accentuated sexual dimorphism in stature, men being much taller than women. Some are mesocephalic, others are pronouncedly brachycephalic, and all are hypsicephalic. They resemble very closely the *Arawak* of the type Dixon called "Paleo-Alpine," since the majority are mesorrhine or subplatyrrhine.

Carib.—The *Carib*, like the *Arawak*, are chiefly concentrated in Venezuela and the Guianas. In Brazil, their southernmost groups are the *Palmela*, on the right bank of the Guaporé River; the *Western Bacaïri*, on the Paratininga River; the *Eastern Bacaïri*, in the Xingú River region, all discovered by Von den Steinen during his 1884 and 1887 expeditions; the *Nahukwa* of the Culiseú River; and the now extinct *Pimeintera* at the headwaters of the Gurgeia River. Cuyabá is as far south as any of these groups have reached.

In northern Brazil there are the *Taulipáng*, in the Roraima River region; the *Pianocoto*, at the headwaters of the Trombetas and Jamundá Rivers; the *Jaricuna*, along the upper Cuiuni River; the *Macushí*, above the Rio Branco. All are scattered throughout the region called Brazilian Guiana.

Anthropometric data on the Brazilian *Carib* are meager.

TABLE 9.—*Anthropometric data on the* Carib

Source	Groups	Number	Stature	Thoracic perimeter	Diam. antero-posterior max.	Diam. transverse max.	Auricular height	Head: Horizontal perimeter	Horizontal cephalic index	Vertical cephalic index	Nose height	Nose breadth	Nasal index
		Males											
Braulino de Carvalho.	*Macushí*	3	158.6	88.0	18.0	14.5	12.2	53.3	80.5	67.7	-----	-----	76.5
Braulino de Carvalho.	*Jaricuna*	2	153.7	89.0	18.5	15.2	13.5	54.0	82.3	72.9	-----	-----	75.0
Ehrenreich	*Bacaïri*	10	160.8	90.9	18.6	14.3	12.0	54.4	79.0	65.6	4.7	3.9	82.9
Ehrenreich	*Nahukwa*	15	162.1	88.6	18.1	15.1	12.6	55.3	80.6	67.4	4.5	3.9	86.6
		Females											
Braulino de Carvalho.	*Macushí*	6	147.9	84.6	17.3	14.4	12.3	52.2	82.8	71.0	-----	-----	74.1
Ehrenreich	*Bacaïri*	6	151.6	81.7	17.7	14.2	11.6	53.6	80.1	65.9	4.3	3.4	79.0
Ehrenreich	*Nahukwa*	12	152.2	81.0	17.8	14.4	12.4	52.2	81.3	70.5	4.3	3.3	76.7

Sexual dimorphism is pronounced among the *Carib;* the *Carib* men are taller than the women, as among the *Arawak*. The limited data available show that the southern *Carib* are taller than the northern ones. They are all either brachycephalic or subbrachycephalic, and all groups are mesorrhine, the *Bacaïri* having the flattest noses.

Macushí-Wapishana.—Among other material sent to the Museu Nacional do Rio de Janeiro by Dr. Braulino de Carvalho, military physician on duty on the frontier, are records on five female adults, crosses of *Macushí* and *Wapishana*, i. e., of *Carib* with *Arawak*.

An examination of table 10 shows that in stature the females more closely approximated the *Arawak*, but in the head and face the *Carib* characteristics dominated, when the cephalic index, the morphological index of the face, and the nasal index are taken into consideration.

TABLE 10.—*Anthropometric data on five* Macushí-Wapishana *females*

Measurements (mm.) and indices	Minimum	Maximum	Mean
Stature (cm.)	150.0	152.5	150.6
Weight (gr.)	43,000	58,000	51,250
Height of trunk	70.5	81.0	77.1
Anterior wall of trunk	42.5	50.3	45.5
Biacromial diameter	29.0	33.0	31.2
Bicristal diameter	27.0	32.0	29.6
Thoracic perimeter	78.0	93.0	83.2
Abdominal perimeter	80.0	91.0	84.8
Length of superior extremity	61.5	68.5	66.5
Length of arm	26.5	31.5	29.3
Length of forearm	19.0	23.0	20.8
Length of hand	13.0	19.0	16.4
Length of inferior extremity	84.0	88.0	86.8
Length of upper leg	44.0	49.0	47.0
Length of leg	31.5	34.2	32.9
Length of foot	21.5	24.5	22.5
Cephalic perimeter	51.0	56.0	52.6
Diam. anteroposterior max	16.0	18.0	17.2
Diam. transverse max	14.0	15.0	14.4
Auricular cephalic height	10.0	13.0	11.3
Horizontal cephalic index	77.7	87.8	83.8
Vertical cephalic index	62.5	72.2	65.6
Capacity of cranium (cc.)	1,000	1,193	1,085
Morphological face height	9.3	11.5	10.5
Bizygomatic diameter	10.0	12.0	11.3
Bigonial diameter	8.5	12.0	10.0
Morphological face index	95.0	115.0	103.8
Nasal index	70.0	80.0	76.9

Tucanoans.—The *Tucanoans* are divided into three geographical groups, eastern, western, and northern. We had the opportunity of studying records, sent to the Museu Nacional do Rio de Janeiro by Dr. Braulino de Carvalho, of 10 males of the *Tucano-Decana* tribe called *Tuiuca* among the *Tucano*. These belong to the eastern

TABLE 11.—*Anthropometric data on 10* Tucano–Decana *males*

Measurements (mm.) and indices	Minimum	Maximum	Mean
Stature (cm.)	151.0	161.0	154.2
Weight (kg.)	51.5	69.0	55.8
Height of trunk	73.5	85.2	79.8
Anterior wall of trunk	44.0	54.5	47.0
Biacromial diameter	29.0	37.0	34.8
Bicristal diameter	25.0	29.0	27.1
Thoracic perimeter	83.0	90.0	82.3
Abdominal perimeter	78.0	90.0	81.2
Length of superior extremity	63.0	74.0	69.8
Length of arm	26.5	33.0	30.6
Length of forearm	20.5	25.0	22.9
Length of hand	15.2	17.8	16.5
Length of inferior extremity	83.0	88.6	86.0
Length of upper leg	41.8	48.8	43.9
Length of leg	33.2	38.8	35.7
Length of foot	23.0	25.5	24.5
Cephalic perimeter	51.0	55.0	53.8
Diam. anteroposterior max	17.5	19.0	18.4
Diam. transverse max	14.5	15.0	14.7
Auricular height	10.0	13.5	12.4
Horizontal cephalic index	77.9	85.7	79.6
Vertical cephalic index	57.1	71.0	67.3
Capacity of cranium (cc.)	950	1,486	1,294
Morphological face height	10.0	12.5	11.2
Bizygomatic diameter	10.0	11.0	10.8
Bigonial diameter	9.4	11.0	10.1
Morphological face index	90.9	119.0	103.9
Nasal index	68.5	80.4	76.0

Tucanoan group. Koch-Grünberg (1905 d), who knew the *Tucano* at first hand, recognized two different types among them, one slender and the other stocky, the difference being so pronounced as to make one think they do not have the same origin. He ascribed to the two types a stature varying from 5 feet 2 inches to 5 feet 6 inches (157 to 167 cm.). Of the 10 records we have, only one individual falls within these limits.

Upon examining the somatological data of the *Tucano-Decanas*, one can see that they do not differ very much from those of the *Tupí*. In both groups, the majority are brachycephalic, hypsicephalic, and mesorrhine.

Tariana.—The *Tariana*, of the *Arawak* family, live on the margins of the Caiari-Uaupés River, in its middle reaches, in a region which juts into the territory of *Tucano* influence.

It is, therefore, not surprising that the *Tariana* have come into contact and crossed with the *Tucano*, as in the cases of the 10 males between the ages of 11 and 19 and one adult whose records appear below.

TABLE 12.—*Anthropometric data on 10* Tucano–Tariana *males*

Measurements (mm.) and indices	I	II	III	IV	V	VI	VII	VIII	IX	X
Age	11	12	14	15	16	16	17	17	19	45
Stature (cm.)	129.0	129.5	146.0	145.5	139.2	145.5	147.0	146.0	156.0	154.6
Weight (kg.)	30.5	34.1	57.2	52.2	39.0	41.8	57.0	61.2	63.2	62.0
Height of trunk	67.7	68.2	79.3	77.0	71.0	75.5	78.0	80.0	------	80.0
Anterior wall of trunk	35.0	38.0	44.5	44.3	42.0	44.5	44.5	46.5	47.0	------
Biacromial diameter	28.5	28.8	33.0	29.0	28.0	27.0	29.0	30.5	34.0	33.0
Biiliac crest	21.0	23.2	23.5	24.3	23.0	23.0	24.0	25.0	27.0	28.0
Thoracic perimeter	67.0	78.0	78.0	77.0	76.0	79.0	81.0	82.0	80.0	87.0
Abdominal perimeter	64.0	70.0	68.0	67.0	70.0	66.0	71.0	73.0	78.0	87.0
Length of superior extremity	60.1	55.5	68.2	68.0	65.0	69.0	65.0	73.5	70.0	71.0
Length of arm	26.0	26.0	26.5	29.5	------	30.3	28.0	28.2	28.0	30.0
Length of forearm	18.2	17.0	25.0	22.5	------	23.2	21.0	26.1	26.0	24.5
Length of hand	15.9	12.5	16.7	16.0	14.5	15.5	16.0	19.2	16.0	16.5
Length of inferior extremity	73.5	72.0	84.0	83.0	76.5	79.0	83.0	80.3	86.0	82.0
Length of upper leg	38.5	37.5	44.5	42.8	38.5	40.3	39.7	39.3	40.0	41.0
Length of leg	29.5	28.9	33.0	34.7	32.0	32.7	32.8	35.0	38.8	34.5
Length of foot	21.0	21.0	24.0	22.0	23.0	24.3	23.3	23.0	23.0	24.3
Cephalic perimeter	50.0	52.0	------	53.0	54.0	51.0	52.0	------	------	56.0
Diam. anteroposterior max	16.5	17.5	18.5	18.0	18.7	18.0	18.5	19.5	19.0	19.5
Diam. transverse max	14.5	15.8	15.0	15.0	15.4	14.0	14.4	15.0	15.2	15.0
Auricular height	11.6	12.5	------	------	13.0	12.5	12.0	12.0	11.0	12.5
Horizontal cephalic index	87.8	90.2	81.0	78.9	82.3	77.7	77.8	81.0	80.0	76.9
Vertical cephalic index	70.3	71.4	------	------	69.5	69.4	64.8	61.5	57.8	64.1
Capacity of cranium (cc.)	113.0	142.2	------	------	150.3	125.5	127.5	133.0	126.6	134.4
Morphological face height	9.5	9.5	10.8	11.0	10.0	11.0	12.0	11.0	12.0	12.0
Bizygomatic diameter	10.4	10.5	10.0	11.0	11.2	9.5	11.0	11.5	12.0	12.0
Bigonial diameter	9.0	10.0	10.0	8.5	9.0	9.7	10.5	10.0	11.0	10.0
Morphological face index	91.3	90.4	98.1	100.1	89.2	115.7	100.0	110.0	100.0	100.0
Nasal index	77.5	78.9	95.0	76.0	82.2	80.0	80.0	80.8	63.1	88.0

The *Tucano-Tariana* approximate the *Arawak* in their mean horizontal cephalic index of 81.4, but their nasal index (79.1) would indicate descent from the *Tucanoans*.

Atlantic Coast and basins of the great rivers.—The *Tupí-Guaraní* were the first people that the Portuguese came into contact with as they touched Brazilian territory; for that reason somatophysical data

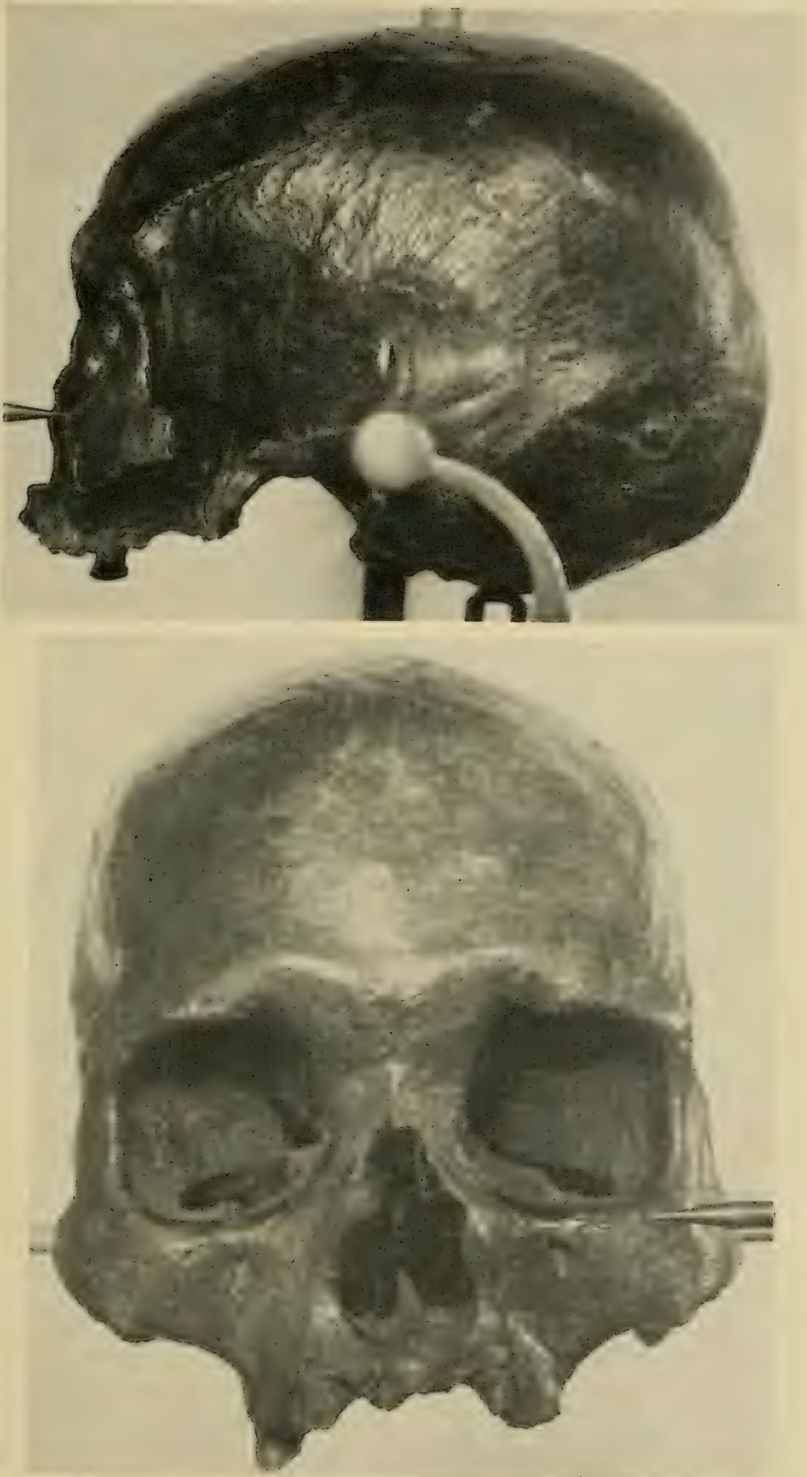

PLATE 23.—Lagoa Santa skull (lateralis and frontalis). This is the skull presented to the Instituto Historico e Geográfico do Rio de Janeiro by Lund. (Courtesy Instituto Historico e Geográfico do Rio de Janeiro.)

on these aborigines are extremely meager. When anthropometric studies were begun in the 19th century, the majority if not all of the Indians of the coast were either extinct or had disappeared through miscegenation.

This great family was not restricted to the Atlantic Coast. Some believe that their focus of dispersion was in the region which borders the Paraguay and Paraná Rivers, from where they spread to the north, completely surrounding the Central-Eastern Plateau of Brazil.

The more important *Tupian* tribes can readily be found on the tribal and linguistic map (this volume; see also vol. 3). All of the tribes on the coast of Brazil receive the general designation *Tupinamba.* They played a very important part in the history of Colonial Brazil, and were to a certain extent absorbed into the population. As tribes, they are completely extinct; so also are the *Tapé* on the coast of Uruguay.

TABLE 13.—*Anthropometric data on the* Tupí–Guaraní

Source	Groups	Number	Stature	Thoracic perimeter	Diam. anteroposterior max.	Diam. transverse max.	Auricular height	Head: Horizontal perimeter	Horizontal cephalic index	Vertical cephalic index	Nose height	Nose breadth	Nasal index
		Males											
Ehrenreich	*Auetõ*	14	159.9	93.0	17.3	14.8	12.2	55.3	85.3	70.5	5.1	3.9	76.4
Ehrenreich	*Camaiura*	14	164.1	91.1	18.5	14.6	11.9	------	78.9	64.3	4.8	3.8	79.1
Von den Steinen.	*Juruná*	2	157.8	------	18.5	15.6	11.5	------	84.3	62.1	5.3	3.6	67.9
R. Lopes	*Tembé*	----	160.9	------	------	------	------	------	78.7	------	-----	-----	69.9
	Urubú	----	157.1	------	------	------	------	------	81.2	------	-----	-----	77.5
		Females											
Ehrenreich	*Auetõ*	2	148.0	82.7	18.5	14.6	11.6	51.9	78.9	62.7	4.1	3.4	82.9
Ehrenreich	*Camaiura*	4	153.7	79.8	18.0	14.0	11.6	------	77.7	64.4	4.4	3.4	77.2
Von den Steinen.	*Juruná*	2	145.0	------	18.0	15.0	11.6	------	83.3	64.4	4.8	3.3	68.7

From table 13, it may be seen that the *Tupí* are short, brachycephalic or subbrachycephalic, leptorrhine or mesorrhine, and have an accentuated sexual dimorphism in stature, the women being shorter than the men.

Summary.—From the paleoanthropological and somatophysical data which we have cited, it is fair to infer that the first inhabitants of Brazil, and probably of South America, were probably the Lácida or the "Homem Lagosantense" (Mattos, 1941) or else the "Homo lagomaritimus" (Eickstedt, 1934). The Lácida, a dolichocephalic and platyrrhine type discovered during the memorable explorations made by Lund in the District of Santa Luzia in Minas Gerais, may be distinguished from the "Sambaquí" type, found in the shell mounds of the southeastern coast of Brazil, also dolichocephalic and platyrrhine, by the height of the skull. The Lácida is definitely hypsicephalic; the "Sambaquí" is chamecephalic. They were, it would seem, contemporary. The craniometric analysis of the "Lagoa Santa" specimens shows that they average two hypsicephalic to one chamecephalic. Eickstedt classified both the Lácidas and the Sambaquís under the designation "Homo lago-maritimus Americanus," although he believes the "Sambaquí" men may belong to a more remote period.

Later, though long before historical times, new elements came to Brazilian territory, the *Arawak*, *Carib*, and *Tupí-Guaraní*. We do not possess exact data to determine the exact period in which they appeared and came in contact with the first inhabitants, but along the Atlantic Coast in the southern part of the country as far as the Doce River, the skulls which have been found in more recent strata of kitchen-middens are all pronouncedly brachycephalic, precluding any mistaking them for skulls of the "Sambaquí" men. These later groups were driven to the Central-Eastern Plateau of Brazil, and together with the Lácidas they disappeared as distinct groups leaving only the *Ge* or "*Tapuya*" as a result of crossing.

Other groups probably worked their way, in successive waves, into the Brazilian "sertões," an hypothesis which would explain the extraordinary number of languages spoken in South America.

From the purely anthropometric point of view, the only incontestable classification that can be made of the present-day aborigines is that which separates the dolichocephalic and platyrrhine or subplatyrrhine *Ge*, living on the Central-Eastern Plateau, from the brachycephalic and leptorrhine or mesorrhine individuals of the coast, the basins of the great rivers, and the Guianas.

Possibly, under the present regime of "Ajudancias," so wisely created by the Serviço de Protecçao aos Indios, from which the Indians receive medical and social help, interesting data may be collected that will serve as a basis for a better and more detailed classification of the remaining Indians of Brazil, before they are completely absorbed into the mass of the Brazilian population.

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See also the following: Bastos d'Avila, 1938 b; Rufz, Broca, and Martin de Moussy, 1860.

THE PIGMENTATION AND HAIR OF SOUTH AMERICAN INDIANS

By Morris Steggerda

In describing the skin, eyes, and hair of South American Indians, one must, of necessity, quote from the writings of anthropologists who are acquainted with the various Indian tribes. This short paper, therefore, is chiefly a compilation of descriptions gathered from such sources. I shall consider first the Indians living in the western part of South America, beginning in the north and continuing south along the Andes to the tip of the continent, and then describe those in the north-central and central parts of South America. It is to be regretted that the descriptions are largely subjective. Very rarely have the anthropologists used any of the more objective color scales which might have proved useful in describing the skin, eye, and hair color. However, the terms used are at least descriptive, and as such are reviewed.

SKIN COLOR

Buschan (1922) makes the general statement that the skin color of South American Indians is lighter than that of the Indians of North America. He describes the skin color of South American Indians as being light yellowish gray, or the color of clay or of tanned leather, and says that this is especially true of the tribes living in the dense forest regions. The Indians of the Orinoco, for instance, have a very light skin color, almost white; while other Indians, whose habitat is mostly in the sun, are of a coppery or even purple-brown color. As a result of crossings with Whites and Negroes, which have taken place over a period of time, all variations of skin color can be noted in South America, from the very dark tribes to those which are very light-colored.

Describing the Indians of the present country of Panamá, Hrdlička (1926) speaks of the *Cuna* as having a medium-brown skin. He notes the frequent occurrence of albinism among these Indians, a condition which is present among other tribes of this area as well; for example, the San Blas Indians, who according to Harris (1926) range from "a normal red to white."

The *Cayapá* Indians, a *Chibchan* tribe living in the present country of Ecuador, are described by Barrett (1925) as being "reddish brown." Their neighbors, the *Tunebo*, are said to have an olive-colored skin (Rochereau, 1924); whereas the *Puinave*, another group living in this area, are of dark skin color, according to Pericot y García (1936), who describes the *Tucano* as having a brown skin.

The *Colorado*, also *Chibchan*, have a reddish skin color. This is to some extent accentuated by their custom of painting their faces and bodies a bright red with a color obtained by grinding the seeds of the achiote plant. Hagen (1939) states that these Indians have generally a lighter skin color than other tribes of the upper Amazon region.

The tribes living in the present country of Perú are dark brown, according to Eberhardt's (1910) observations. The *Aymara*, living in the Andean Highlands of Perú, have been studied by McMillin (1927) who speaks of them as having a "swarthy brown to coppery" skin, or even a "dark olive" color, some being lighter with a yellowish hue. Ferris (1921) mentions that there are light as well as dark-brown individuals among this tribe, according to the degree of mixture with other races. Pericot y García (1936), on the other hand, calls their coloring olive gray, and adds that they are lighter than the neighboring *Quechua*.

The *Araucanians*, living farther to the south, are described as light to olive brown by Pericot y García (1936), reddish brown by Latcham (1904 b), and light brown to yellowish by Ten Kate (1904).

The *Tehuelche* of Argentina are said by Ten Kate (1904) to be light brown or yellowish brown. Of the *Guato* of the upper Paraguay River, Markham (1894) says the skin color is very light.

On the extreme southern tip of South America are the *Ona*, *Yahgan*, and *Alacaluf*. Lehmann-Nitsche (1927) records the skin color of the *Ona* as very light yellow to brown, whereas Garson (1885) says that they are reddish brown, the shade of mahogany or bronze. Gusinde (1937), an authority on the Fuegian Indians, describes the *Yahgan* as yellowish brown; and the same term is used by Hyades and Deniker (1891), who add that they may also be reddish, and that the females are of lighter color than the males. The *Alacaluf* are classed by Skottsberg (1913) as being of the same color as the *Yahgan*, while Pericot y García (1936) calls them merely "brown."

Turning to the Indians of the northern and central regions of South America, we shall first consider the *Carib* linguistic family, to which the *Taulipáng* belong. According to Pericot y García (1936), they have a delicate brown skin color; Koch-Grünberg (1923) describes the skin of the pure-blooded *Taulipáng* as "velvety, soft, and light brown." The *Makiritari*, also a *Carib* tribe, are said to be "almost white."

In describing the *Central Carib*, Farabee (1924) discerns two main groups: one of the savannah and one of the forest. The savannah tribes are of darker skin color than the forest tribes, who live in the dense and shady jungles. Hawtayne (1886) found two types of *Carib* in the Island of St. Vincent: the yellow or red, and the so-called "*Black Caribs*," who are a hybrid race, a cross between yellow *Carib* and Negroes. Gillin (1936), in speaking of the Barama River *Carib*, mentions among their characteristics a light to red-brown skin color.

The *Yaruro* in Venezuela are Mongoloid in appearance, and have a very dark skin color (Petrullo, 1939).

Writing of the *Arawak*, Pericot y García (1936) points out that they have a lighter skin color than the *Carib*. Ferris (1921), in describing the *Machiguenga*, an *Arawakan* tribe of eastern Perú, states that about 30 percent of them are of light skin color, 3 percent dark, and the remaining 67 percent medium brown. Another *Arawakan* tribe, the *Paressí*, have been studied by Roquette-Pinto (1938) who says that they are copper-yellow, of a darker shade in the *Cozarini* and lighter in the *Uaimare* regions. The *Passé*, also *Arawak*, are described by Markham (1895) as nearly white, resembling Caucasians. The same author also speaks of the *Puru-Puru* (*Arawak*) as having among them a number of individuals who show white and brown patches of irregular size and shape on the skin. This, however, is a pathological condition. He also considers the *Tacuna*, and calls them darker than most Indians located on the Marañón River. The *Tariana* have a glossy brown skin color; the *Pawumwa* or *Chapacura*, living along the Guaporé River, range from a dark, coppery color to a very light brown (Haseman, 1912).

The *Yamamadí*, *Ipurina*, and *Botocudo* live in the dense forest regions of Brazil, and here again we find a yellowish-gray skin color (Ehrenreich, 1897); according to Manizer (1919), the *Botocudo* are light brown. The *Anambé*, a *Tupí* group living on the lower Tocantins River, show an almost white skin color. The *Chiriguano*, another *Tupí* tribe, are yellowish-brown (Ten Kate, 1904). The *Sirionó* of eastern Bolivia are often very light; in fact, Wegner (1934 a) makes the statement that there are some white *Sirionó*.

The skin of the *Bororo* and *Carajá*, as described in Ehrenreich's (1897) observations, is reddish in color, the *Bororo* being darker than is usual among the *Tupí*. The *Caingang* were found to be both light and dark, depending upon the region in which they lived (Pericot y García, 1936).

The *Nambicuara* are described by Roquette-Pinto (1938) as having a skin color of burned-yellow, which is darker in the *Cocuzu* subtribe, and in the *Tagnani* tends to show shades of pink. Markham (1895) states that the Indians of the entire Amazon Valley have skins of various coppery or brown shades, which often appear to have the color of smooth Honduras mahogany.

EYE COLOR AND FORM

The majority of the authors quoted in the section on skin color have also reported an eye color, and in many cases on the shape of the eye and form of the eyelid. Their remarks are, in the main, very uniform. The most typical descriptions of eye color are "dark brown," "black," and "dark brown to black"; and the terms most frequently used to describe shape are "Mongoloid eyes," "eye slits oblique," and "small eyes." Therefore, in this section, mention will be made only of those descriptions that deviate from the general usages.

One of the tribes of which something unusual has been said is the *Chipaya*, of highland Bolivia, among whom, according to Posnansky (1918), the Mongolian eyefold is unknown.

Harris (1926), in describing the eyes of the San Blas Indians, says that in the "brown Indians" the iris is medium to dark brown, while in the partial albinos it varies from hazel (blue with brown spots) to dark blue and dark violet.

Describing the eyes of the *Aymara*, Ferris (1916) states that the areola of the iris is medium maroon, and the periphery greenish-yellow. Pericot y García (1936) differs from this slightly, saying that the iris is dark brown and the cornea yellowish. Chervin (1913) has observed that the *Aymara* have lighter eyes than the *Quechua*, whose eye color has incorrectly been called "black," whereas it is really of various shades of chestnut.

Among the *Tehuelche* described by Ten Kate (1904), only one had a Mongolian eyefold, and all had eyes of a light-brown color. In speaking of the eyes of newborn *Yahgan*, Hyades and Deniker (1891) say that the iris is black, and becomes light brown after a few days, then turning to dark gray with a bluish shade after 2 weeks. After the tenth month the eyes are dark brown in all children. Gusinde (1931) states that the eyes of the adult *Yahgan* are either light hazel or various shades of brown to deep black.

Gusinde, who has studied the *Alacaluf*, observed that the eyes of these Indians range from light hazel to deep black. Skottsberg (1913) remarks that their eyes are dark blue in children and become deep brown in adulthood. Both Gusinde (1931) and Pericot y García (1936) point out that the *Alacaluf's* eyes are Mongoloid in appearance.

Concerning the *Nahucua* and *Bororo* Indians of Brazil, Ehrenreich (1897) says that the iris showed a blue color in a few of the individuals observed, while the majority had different shades of brown. The *Botocudo* have eyes of a medium light color, according to Manizer (1919).

HAIR COLOR AND FORM

In describing the hair of Indians in both North and South America, anthropologists very frequently use the general adjectives: "coarse," "black," and "straight." Many tribes, however, do differ from this description; and those comments of anthropologists that deviate significantly are recorded below.

According to Harris (1926), who has made a thorough study of the brown and white Indians of San Blas, the hair is black in brown Indians, and from flaxen to straw-colored in the white Indians.

Commenting on the hair of the *Aymara* and *Quechua,* Ferris (1921) states that it is generally black, straight, and abundant, but that the hair on the face is scant in both mixed and pure *Quechua.* There is very little grayness among these Indians, he says. Similar remarks have been made by Pericot y García (1936) and Forbes (1870).

The Araucanians, who also have dark and straight hair, have no body hair (Latcham, 1904 b); but Ten Kate (1904) has seen some individuals among them with a slight beard or moustache. The same author made identical observations on the hair of the *Tehuelche:* that it is abundant, straight, and black, and that here also some individuals have a slight moustache.

The *Yahgan* have the same general characteristics, and Hyades and Deniker (1891) emphasize the Mongoloid appearance of these Indians. Gusinde (1937) also mentions the scant body hair, which he says is typical of all Fuegians. Skottsberg (1913) describes the hair of the *Alacaluf* as brown, in contrast to the uniformly black hair of the Fuegians.

Ferris (1921), an authority of the *Arawak,* reports that the hair of the *Machiguenga* tribe is long, thick, dull, black, and fine. The scalp hair is straight in all males, but he found one female individual who had slightly wavy hair. He found that beards were entirely absent in 38.8 percent of the males, sparse in 18.8 percent, and present to a small extent in 42.4 percent. Similar observations have been made upon the *Machiguenga* by Farabee (1922), and he adds that face hair is pulled out by the men, whenever it appears.

The hair of the *Caingua* is both wavy and straight, as reported by Pericot y García (1936). That of the *Cayua,* of the *Tupí* linguistic family, as described by Koenigswald (1908 a), is always straight, black, and thick, and is worn long. Baldness and grayness of hair is unknown even in the oldest individuals of this tribe, according to the same author.

In the *Guayakí,* the hair varies from brown to shiny black (Vellard, 1934). Serrano (1930) has made an interesting observation on the *Mataco* and *Chorotí;* the hair of adults is black, while in the children it is reddish. Karsten (1932) describes the hair of these adults merely as long, black, and coarse.

Roquette-Pinto (1938) comments on the hard, straight hair of the *Nambicuara*, but mentions that he has seen a few of these Indians with wavy hair.

The *Puinave*, an independent group in Colombia, is worthy of special comment; Pericot y García (1936) quotes a remark taken from Tastevin, in which the hair color of these Indians is described as chestnut brown to almost blond. Pericot y García (1936), however, states that their hair is black and straight; and he also mentions that the men have scarcely any beard, except occasionally on the upper lip.

The *Tucano* have short, black, and often frizzly hair, according to Pericot y García (1936).

The most usual description of the Indians of the Mato Grosso, the Purús River region, and the Xingú district of Brazil, indicated that their hair is coarse, black, and straight; but this is apparently not true of all these tribes. Only among the *Bororo* and *Carajá* is this type of hair predominant. According to Ehrenreich (1897), other groups show individuals with thick, wavy, and fine hair; there are frequently people with curly hair, mostly among the *Bacaïri*. The *Bacaïri* hair color, though apparently black, shows a brown hue in strong sunlight, and the children always have this shade of hair. Old people have gray hair, but white hair has not been observed by this author.

Wavy and frizzly hair has also been seen among certain individuals of the *Arawak* tribes; according to Pericot y García (1936), the incidence of wavy and frizzly hair is rather great. Among the Indians whose hair sometimes diverges from the norm are also the *Botocudo*. There is a frequency of reddish-brown hair in this tribe (Manizer, 1919).

Stegelmann (1903) also discovered a tribe of peculiar appearance living on the upper Envira River in Brazil. Their hair was light red, similar to that found in certain Jewish types. Their skin was red also. The other Indian tribes called them "*Coto*," which means "howling monkey," because of the similarity of their color to that of this particular monkey.

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See also the following: Aichel, 1932 b; Henckel, 1934; Trotter, 1943.

BLOOD GROUPS OF SOUTH AMERICAN INDIANS

By William C. Boyd

The hereditary blood groups (O, A, B, AB) represent a set of physical characteristics determined by three allelomorphic genes (*O*, *A*, *B*). The study of blood groups is of value to physical anthropology because they are genetically determined by a known mechanism, absolutely objective in character, completely unaffected by environment, not subject to mutation at any rapid rate (Wyman and Boyd, 1935; Haldane, 1940), and nonadaptive as far as extensive investigation indicates. These merits should render blood groups a most useful criterion in elucidating the classification of mankind and human evolution.

The genes determining the four blood groups vary in frequency in different human populations, with B highest in Asia, and A highest in Spain, Australia, the Scandinavian countries, and North American Indians. Maps showing these distributions will be found in Boyd (1939 b) and Haldane (1940).

The more recently discovered M, MN, and N types (Landsteiner and Levine, 1927) are determined by two allelomorphic genes without dominance. These types are independent of the O, A, B, AB blood groups. World distribution of the M, N types has not been as extensively studied as that of the O, A, B, AB groups, but the existing evidence suggests that their frequency is mainly more uniform. N type is highest in Australian aborigines; M type is highest in American Indians (Boyd, 1939 b; Birdsell and Boyd, 1940).

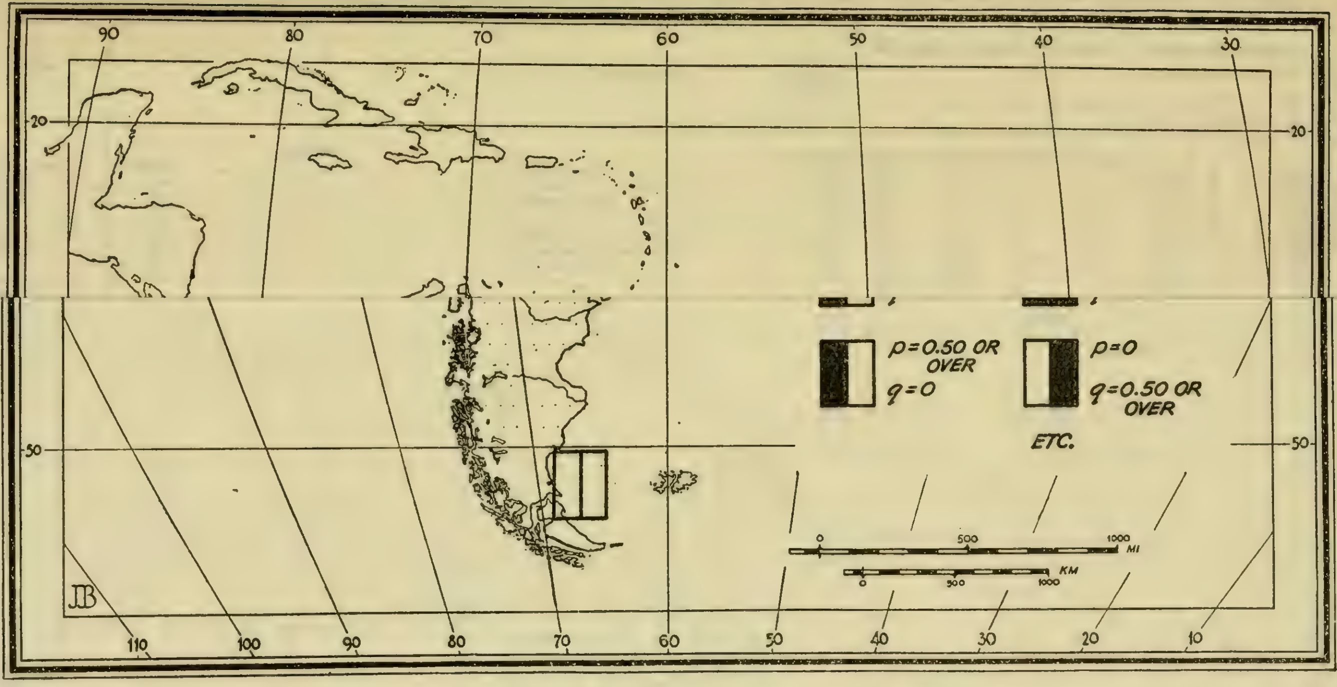
The study of the blood groups as a physical anthropological characteristic goes back to the pioneer studies the Hirszfelds (1919) made during World War I. The inevitable extension of such studies to American aborigines was made in 1923 by Coca and Deibert (1923), who reported results on Indians of the Haskell Institute, Lawrence, Kansas, U. S. A. Although these and later authors found fair amounts of group A, the fact that A was much lower than in peoples of European stock, and that in some Indian groups nothing but group O was found, led to the suggestion that originally American Indians possessed only group O, and that the A and B found were due to admixture of White blood. This idea received a serious set-back when the reports of Rahm (1931 c) and Matson and Schrader (1933), dealing with *Yahgan* in Tierra del Fuego, and *Blackfoot* and *Blood* in Montana, respectively, were published. Mathematical analysis (Wyman and Boyd, 1935; Boyd, 1939 a) shows that in fact a majority of the results on Indians cannot be explained on this hypothesis.

Boyd (1940) has suggested that the present distribution of blood groups in American aborigines is due to (*a*) several successive migrations of small numbers of persons, the various migrations representing somewhat different stocks; (*b*) the effects of isolation (Wright, S., 1931 a, 1931 b) of such immigrants in America, which led occasionally to the loss of one or more genes. Such a suggestion would account for the uneven character of the blood-group distribution in South America, where it seems evident that many tribes possessed only group O, others had O and A, one or two perhaps had some B, and some perhaps possessed both A and B.

The available results on blood groups in South American Indians are presented in table 1, and those on the M, N frequencies in table 2. For discussion of statistical evaluation of the relative reliability of various results, see Boyd (1939 a, 1939 b), Haldane (1940). The results are arranged by countries, except that Tierra del Fuego is listed separately.

The O, A, B, and AB percentages suggest the uneven distribution already mentioned. A number of tribes seem to have originally possessed only group O. Such were probably the *Chunupí*, *Mataco*, *Toba*, *Guaraní*, and *Macá*, perhaps most of the Indians of Ecuador, and the Indians at Naranjal in Colombia. The *Carajá* (Golden, 1930) may have possessed considerable B, although the exact percentage is hard to estimate from the tests reported, since such small numbers are involved. In answer to the doubt often raised as to the reliability of Golden's results, it may be pointed out that he used the same sera to test peoples of European stock and achieved the expected results. Nevertheless, it is now the only tribe in which any significant amount of B seems at all credible, judging by the results available. A reexamination of the *Yahgan* indicates that the non-O groups are due to racial admixture. Prof. A. Lipschutz found that of 20 pure-blood *Yahgans*, all were group O. Some non-O, although not a high percentage, was found in 20 *Yahgans* known to be mixed. A similar check upon the *Carajá* would be highly desirable, but for the meantime it seems best to provisionally accept the original report.

It is not too easy to say which South American tribes certainly possessed group A before White contact, but we may speculate that the *Colla* and *Pilagá* are among them.



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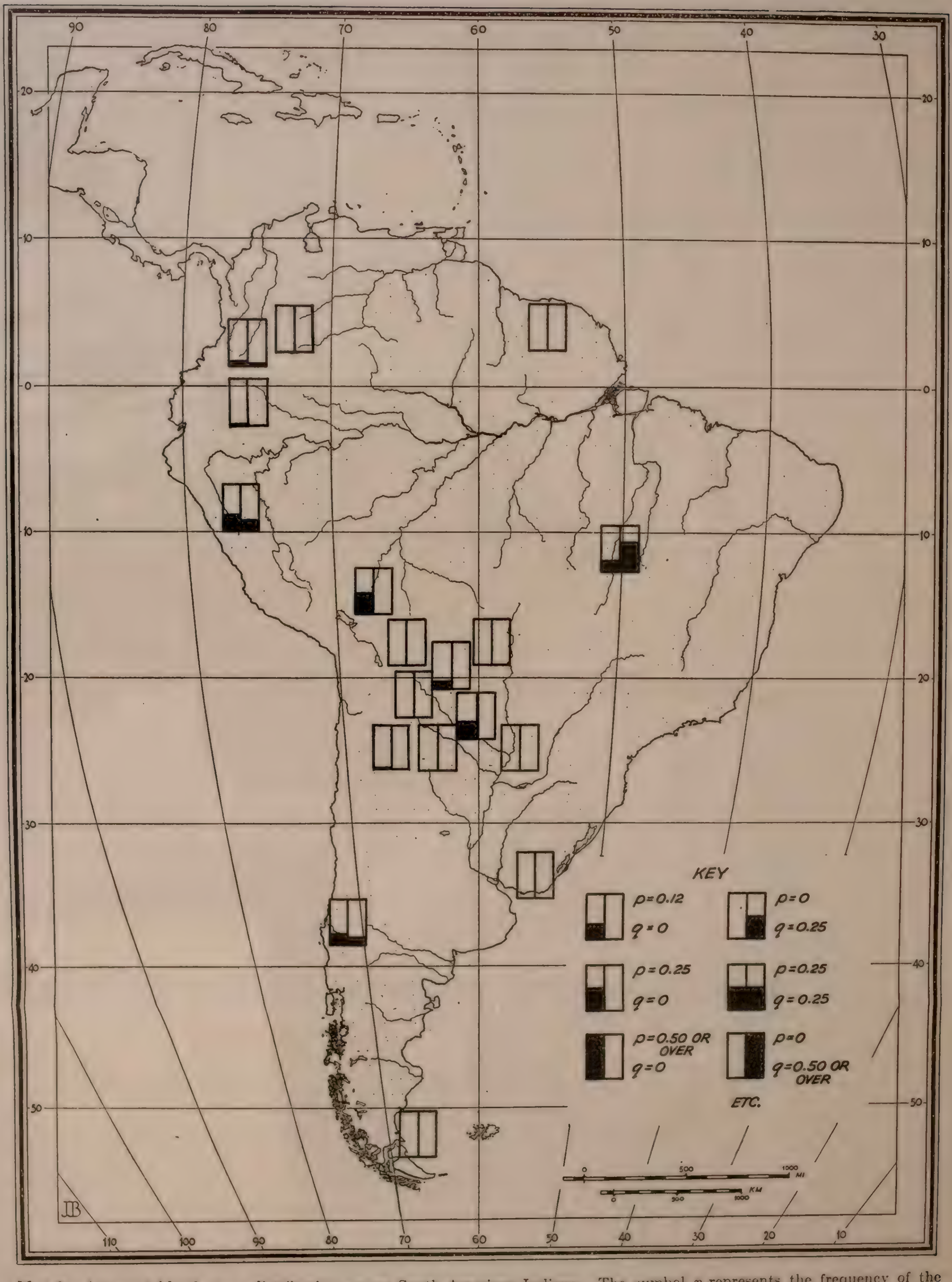
Map 6.—Apparent blood-group distribution among South American Indians. The symbol p represents the frequency of the gene for A, q that for B. Approximate percentages shown by height of solid columns, p on left, q on right.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Map 6.—Apparent blood-group distribution among South American Indians. The symbol p represents the frequency of the gene for A, q that for B. Approximate percentages shown by height of solid columns, p on left, q on right.

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TABLE 1.—*Classification of South American Indians by blood groups: O, A, B, and AB groups*

Tribe	Place	Investigation	Individuals tested	Individuals having blood type—				Frequency of gene—			D/σ [1]
				O	A	B	AB	A (p)	B (q)	O (r)	
	Argentina		*Number*	*Percent*	*Percent*	*Percent*	*Percent*				
Chorotí	Chaco	Mazza et al.[2]	147	89.1	10.9	0	0	0.056	0	0.944	
Chunupí	do	do	55	100	0	0	0	0	0	1.000	
Chunupí	do	Mazza (1939)	282	95.3	4.2	0	.3	.022	0	.977	
Mataco	do	do	78	100	0	0	0	0	0	1.000	
Mataco	do	Mazza et al.[2]	135	96.3	3.7	0	0	.018	0	.982	
Mataco	do	Alvarez (Comas, 1941)	227	[3] 78.8	15.0	4.0	[3] 2.2	.099	.021	.890	3.90
Pilagá	do	Mazza et al.[2]	46	82.6	17.4	0	0	.091	0	.909	
Toba	do	do	194	98.5	1.5	0	0	.007	0	.993	
Chiriguano *Chaguanco* *Chamacoco*	do	do	120	100	0	0	0	0	0	1.000	
	Quebrada de Huamahuaca, Cochinoca, and Yaví.	Paulotti and Gonzáles (1943)	209	94.7	4.5	0	.7	.023	0	.972	
	Brazil										
Carajá	Araguaya River	Golden (1930)	61	39	5	51	5	.039	.324	.624	.4
	Chile										
Mapuche (Araucanian).	Temuco	Rahm (1931c)	382	75.6	17.2	6.2	.6	.094	.035	.870	.5
	Colombia										
Páez	Tierradentro	Arcila Vélez (1943)	303	92.7	4.1	3.2	0	.021	.017	.963	.5
Do	San Lorenzo	Duque (1944)	351	92.9	6.5	.6	0	.033	.003	.964	0
Do	La Montana	do	123	91.9	4.9	3.2	0	.025	.017	.959	.302
Do	Bonafort	do	175	93.1	4.6	2.3	0	.024	.012	.965	.2
Páez	Quinchía	Duque (1944)	125	89.6	10.4	0	0	.053	0	.947	
Do	Naranjal	do	50	98	2	0	0	.010	0	.990	
Guambía-Coconuco.	Cauca	Lehmann, Duque, & Fornaguera (1943).	584	84.2	8.6	6.2	1.0	.046	.033	.918	2.94
Sibundoy and *Santiago.*	Sibundoy and Santiago	Páez and Freudenthal (1944).	251	86.4	6.4	7.2	0	.034	.038	.930	.8
	Pasto	do	204	70.6	18.1	10.3	1.0	.102	.059	.840	.3
Coaiquer	Ricaurte	do	41	95.1	4.9	0	0	.025	0	.975	

TABLE 1.—*Classification of South American Indians by blood groups: O, A, B, and AB groups*—Continued.

Tribe	Place	Investigation	Individuals tested	Individuals having blood type—				Frequency of gene—			D/σ[1]
				O	A	B	AB	A (p)	B (q)	O (r)	
			Number	*Percent*	*Percent*	*Percent*	*Percent*				
Pijao	Ortega	Reichel-Dolmatoff (1944)	569	87.5	5.3	4.7	2.5	.028	.025	.935	14.85
Do	Coyaima	do	439	96.3	3.4	0	.2	.017	0	.981	
Do	Natagaima	do	281	100	0	0	0	0	0	1.000	
	Ecuador										
	Imbabura	Santiana (1944)	1,445	95.2	3.4	.8	.6	.017	.004	.976	7.6
	Pichincha	do	392	96.1	2.2	1.2	.5	.011	.006	.980	8.05
	Cotopaxi	do	1,446	95.2	3.4	1.4	0	.017	.007	.976	.5
	Tungurahua	do	1,124	93.4	4.7	1.7	.1	.024	.009	.967	2.58
	Chimborazo	do	1,410	94.6	4.5	.8	.1	.023	.004	.973	.7
	Napo-Pastaza	do	944	98.0	1.8	.2	0	.009	.001	.990	0
	Paraguay										
Guaraní		Ribero et. al.[2]	107	100	0	0	0	0	0	1.000	
Macá	Chaco	Urizar (1942)	111	97.3	.9	1.8	0	.004	.009	.987	
	Perú										
Colla		Mazza et. al.[2]	115	63.5	36.5	0	0	.203	0	.797	
"p"[4]		Arce Larreta et al.[2]	200	100	0	0	0	0	0	1.000	
"m"[4]		do	1,372	75.1	14.1	7.2	3.6	.078	.041	.867	13.1
"m"[4]	Huanacabamba and Perico	Moss and Kennedy (1929)	187	55.6	25.1	13.4	5.9	.153	.085	.746	2.47
	Surinam										
Alkuyana	Gran Boree and Green Cassava Falls	Kahn (1936)	70	100	0	0	0	0	0	1.000	0
	Tierra del Fuego										
Ona		Rahm et. al.[5]	18	94.4	5.6	0	0	.028	0	.972	
Yahgan	Navarino Is.	Rahm (1931 c)	33	9	0	91	0	0	.700	.300	
Do	do	Lipschutz	20	100	0	0	0	0	0	1.000	

[1] D/σ is the ratio of 1−(p+q+r) and its standard deviation; in results done without error on populations in genetic equilibrium, its value should not exceed 2.00 more than once in 20 times.

[2] Steffan and Wellisch, 1936; Boyd, 1939 b.

[3] Recalculated.

[4] "p"=pure, "m"=mixed.

[5] Lattes, 1932; Boyd, 1939 b.

TABLE 2.—*Classification of South American Indians by blood groups: M and N groups*

Tribe	Place	Investigators	Individuals tested	Individuals having blood type—			Frequency of gene—		D/σ
				M	MN	N	M (m)	N (n)	
	Argentina		*Number*	*Percent*	*Percent*	*Percent*			
Chunupí	Chaco	Mazza (1939)	282	81.2	11.3	6.7	0.869	0.124	5.37
	Chile								
Mapuche	Temuco and Phillanlelbun.	Henckel et al. (1941).	100	57	34	9	.74	.26	1.1

The M and N results fit into the general trend indicated by all the North American results thus far published. All American aborigines seem to have possessed low frequencies of N. The importance of new tests to check this in South America is obvious.

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See also the following: Candela, 1943; Imbelloni, 1937 c.

THE BASAL METABOLIC RATES OF SOUTH AMERICAN INDIANS

By Elsie A. Wilson

Of the many studies of basal metabolism that have been made in South America, only two deal with pure-blooded American Indians. Pretto (1938) in Perú and Albagli (1939) in Brazil made metabolism measurements on individuals of mixed White and Indian blood, but apparently, judging from the accessible literature, Hurtado and Pi-Suñer are the only investigators who have studied Indians of pure race in South America.

The observations of A. Hurtado (1927, 1928, 1929) in Perú afford information regarding the basal metabolism of Indians of pure race, living not only at sea level but at high altitudes and in subtropical and tropical climates. Some of these Indians came from different mountainous regions but had lived for from 2 weeks to 4 years in the subtropical climate of Lima and were studied there. Others were natives of the mountainous regions of Arequipa, Santa Lucia, and Oroya, and were adapted to life at high altitudes. A few had resided only a short time in Oroya and were not adapted to the altitude. Still others were natives of Piura, a tropical region in northern Perú. In Oroya the observations were made by Hurtado's colleague, Dr. Enrique Rondón. Among the 116 Indian men studied, 90 were soldiers in active service and, if living in the mountains, were adapted to conditions there. Seventy percent of these men had basal metabolic rates within ±10 percent and 90 percent of them rates within ±15 percent of the normal standards established for White men in North America by Harris and Benedict (1919) and by Aub and Du Bois (1917). The average deviation of the basal metabolism from the Harris-Benedict standard was +4 percent in Lima, −3 percent in Arequipa, ±0 percent in Santa Lucia, and +1 percent in Piura. The average deviation for all 90 men was only −1 percent. Eight Indian men in Piura who led a sedentary life had metabolic rates averaging ±0 percent (−7 percent, Aub and Du Bois, 1917). Seven Indian women in Lima showed an average deviation of −1 percent and three Indian women in Santa Lucia, +7 percent (±0 percent, Aub and Du Bois, 1917).

Hurtado concludes that, although their racial and anthropometric characteristics are distinct from those of other races and although their habits of life are different, these Peruvian Indians have basal metabolic rates within normal limits of the standards established for North American Whites and show no divergence from the standards that can be attributed to racial characteristics or diet. This conclusion applies not only to Indians living at sea level but also at higher altitudes (if adapted to life at high altitude) and in the Tropics, and it is equally true of those leading a physically active life and those leading a sedentary life. White men living in Lima, Santa Lucia, and Oroya were also found to have metabolic rates close to the normal standards, which further supports Hurtado's claim that the metabolic level of the Peruvian Indian is similar to that of the White race.

The data of Rondón (Hurtado, 1927–29) on 18 Indians in Oroya show that those who had resided there for many years and were completely adapted to the mountains had metabolic rates within normal limits, but that those who had come to Oroya from lower regions and were not adapted had rates averaging 16 percent below the standards. This decrease in the metabolism of the latter subjects, Hurtado believes, represents a compensatory phenomenon, which confirms his theory that in individuals not adapted to high altitudes the organic activity is reduced to enable the body to support better the energy requirements in physical activity.

Pi-Suñer (1933 a, 1933 b, 1933 c, 1933 d) studied the basal metabolism of the *Araucanian Mapuche* (31 men and 14 women) of southern Chile at the Franciscan missions of Puerto Saavedra and Puerto Dominguez. This tribe, according to Pi-Suñer, has had little intermixture in the province in which the work was done. From measurements of the sitting height and calculation of the pelidisi therefrom, Pi-Suñer concludes that the nutritional state of these *Mapuche* was practically normal. The men had metabolic rates averaging 9.8 and 9.3 percent and the women strikingly high rates averaging 14.8 and 14.4 percent above the Harris and Benedict and Aub and Du Bois standards, respectively. Associated with the high metabolic rates were pulse rates that were slower than the normal for the White race. This dissociation between pulse rate and metabolism was shown to a more marked degree by the men than by the women. Hurtado also noted low pulse rates with some of his Indian subjects but found that the rate was higher in those living in the mountains.

The pertinent data obtained on these two groups of South American Indians are summarized in tables 1 to 3 and, for comparative purposes, the data are also included that have been reported for *Maya* Indians of Yucatán and Guatemala in Central America, *Chippewa* Indians of Canada, and United States Indians in Arizona and South Dakota. That only nine investigations have thus far been made on the basal metabolism of pure-blood American Indians and that only two of these concern the South American Indian emphasizes the need for further studies of this nature.

TABLE 1.—*Comparison of the conditions of the basal metabolism studies on American Indians*

Indians studied	Locality	Altitude	Season	Outdoor temp. (avg.) °C.	Nature of diet	Respiration apparatus used	Investigators
	SOUTH AMERICA						
Mapuche	Araucania Chile	Sea level	Spring (September).	9.3	Protein-poor	Benedict-Roth and Krogh	Pi-Suñer (1933 a, b, c, d).
Peruvian	Perú:						
	Lima	do		16–20	Carbohydrate-rich.	Benedict-Roth	Hurtado (1927, 1928, 1929).
	Arequipa	2,300 m		16–23	do	do	Do.
	Santa Lucia	4,038 m		14–24	do	do	Do.
	Piura	Sea level		20–25	do	do	Do.
	Oroya	3,658 m		12–20	do	do	Do.
	CENTRAL AMERICA						
Maya	Yucatán:						
	1st expedition	Ca. 27 m	March, April, July.	[1] 23–32	Protein-poor; chiefly maize.	Benedict field	Williams and Benedict (1928).
	2d expedition	do	January-March	[1] 16–29	do	do	Shattuck and Benedict (1931).
	3d expedition	do	February-April	20.4	do	do	Steggerda and Benedict (1932).
Maya Quiché	Guatemala:						
	Totonicapán	2,500 m	December, January.	12–16		Jones	Crile and Quiring (1939 b).
	Pacific slope	244 m	do			do	Do.
	CANADA						
Chippewa	Churchill	Sea level	August	(²)	Fish, game, store food.	do	Crile and Quiring (1939 a).
	UNITED STATES						
Indians	Flandreau, S. Dak				Carbohydrate-rich.	Benedict student	Shaw (1933).
Navaho	Ganado, Ariz				Chiefly mutton		Salsbury (1939).

[1] Room temperature.
[2] Subarctic: warm, sunny.

TABLE 2.—*Age, height, weight, and body temperature of the American Indians studied* [1]

Sex and group	Number of subjects	Age (years)			Height (cm.)			Weight (kg.)			Mouth temp. (°F.)		
		Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.
Males:													
Mapuche	31	19	44	26	151	170	163	52	87	67	------	------	-----
Peruvian:													
Lima	15	18	29	21	152	167	158	51	68	58	------	------	-----
Arequipa	44	18	30	21	150	170	160	47	71	61	------	------	-----
Santa Lucia	16	19	24	20	150	166	159	53	71	63	------	------	-----
Piura	15	18	30	22	150	168	161	51	78	62	------	------	-----
Piura	8	17	34	20	149	171	160	48	77	58	------	------	-----
Oroya	8	17	53	26	155	170	162	54	73	61	------	------	-----
Oroya	10	20	27	21	158	168	162	61	72	64	------	------	-----
Maya (Yucatán):													
1st expedition	32	16	44	24	145	172	158	45	67	54	96.4	98.4	97.2
2d expedition	26	15	32	22	148	168	159	45	58	53	------	------	-----
3d expedition	30	16	40	27	146	167	156	43	64	54	------	------	-----
Maya Quiché:													
Toton capán	30	18	33	22	152	172	159	50	70	58	97.0	98.6	97.6
Pacific slope	5	19	24	22	149	167	161	42	57	50	97.4	97.5	97.4
Chippewa	6	21	40	29	164	177	169	60	70	63	95.8	97.0	96.9
Females:													
Mapuche	14	18	45	26	149	160	153	53	83	67	------	------	-----
Peruvian:													
Lima	7	15	23	18	140	158	148	39	56	48	------	------	-----
SantaLucia	3	13	21	16	143	152	149	42	60	51	------	------	-----
Chippewa	7	15	50	33	152	166	158	49	69	60	97.0	98.4	97.6
S. Dakota	4	18	20	19	156	168	162	50	62	55	------	------	-----

[1] No data are reported by Salsbury (1939) for the Navaho Indians.

TABLE 3.—*Blood pressure, respiration and pulse rates, and basal metabolic rates of American Indians*

Sex and group	Number of subjects	Respiration rate			Pulse rate			Heat production per 24 hrs.	Basal metabolic rate (percent)[1]				Occupation
		Min.	Max.	Avg.	Min.	Max.	Avg.		Min.	Max.	Avg.	Number of plus rates	
Males:													
Mapuche	31	----	----	----	42	76	60	1,795	−13	+36	+9.8	28	Agriculture.
Peruvian:													
Lima	15	9	24	16	38	64	54	1,570	−9	+15	+4	9	Soldiers.
Arequipa	44	8	24	14	44	84	57	1,483	−24	+15	−3	10	Soldiers.
Santa Lucia	16	8	19	14	60	80	69	1,624	−17	+20	±0	10	Soldiers.
Piura	15	10	24	14	48	76	61	1,598	−15	+21	+1	8	Soldiers.
Piura	8	8	18	14	56	80	64	1,539	−12	+25	±0	3	Sedentary.
Oroya	8	12	22	16	54	76	65	1,495	−12	+3	−3	2	Nonsoldiers.[2]
Oroya	10	10	19	14	50	72	59	1,350	−37	±0	−16	0	Soldiers.[3]
Maya (Yucatán):													
1st expedition	32	5	23	13	40	79	55	1,500	−9	+21	+5.2	23	Excavations, masonry. agriculture.
2d expedition	26	9	28	17	40	65	56	1,515	−13	+25	+5.8	20	
3d expedition	30	----	----	----	34	80	52	1,522	−5	+26	+8.4	26	
Maya Quiché													
Totonicipán	30	----	----	----	48	96	62	1,661	−1	+22	+8.2	26	Soldiers.
Pacific slope	5	----	----	----	57	66	61	1,542	−6	+12	+5.2	4	Laborers.
Chippewa	6	----	----	----	42	62	53	1,897	+9	+44	[4] +18.0	6	Hunting, fishing.
Females:													
Mapuche	14	----	----	----	50	84	67	1,669	−11	+39	+14.8	12	Agriculture.
Peruvian:													
Lima	7	12	20	17	58	84	71	1,292	−11	+10	−1	2	--------------
Santa Lucia	3	16	16	16	60	68	64	1,450	+5	+12	+7	3	--------------
Chippewa	7	----	----	----	52	78	65	1,640	+5	+64	[5] +18.5	7	--------------
South Dakota	4	----	----	----	----	----	----	1,452	−3	+14	+4.9	2	School girls.
Navaho (sex?)	----	----	----	----	----	----	----	--------	------	------	[6] +2.4	------	--------------

TABLE 3.—*Blood pressure, respiration and pulse rates, and basal metabolic rates of American Indians*—Continued.

Sex and group	Number of subjects	Blood pressure[7] Min.	Blood pressure[7] Max.	Blood pressure[7] Avg.
Males:				
Maya (Yucatán)				
2d expedition	26	90/60	118/90	100/75
Maya Quiché				
Totonicipán	30	98/65	128/90	111/77
Pacific slope	5	95/68	114/79	104/73
Chippewa	6	102/75	134/85	120/80
Females:				
Chippewa	7	114/70	145/86	124/75
Navaho (sex?)				112/72

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[1] Harris-Benedict standard in all cases except *Chippewa* and *Maya Quiché* Indians, where the Mayo standard was used. The average deviation from Harris-Benedict standard is calculated to be +19.5 and +20.1 percent for male and female *Chippewas*, respectively, and +10.3 and +9.5 percent for *Maya Quiché* soldiers and laborers, respectively.

[2] Adapted to high altitudes. "Natives and residents."

[3] Not adapted to high altitudes.

[4] Omitting maximum of +44 percent.

[5] Omitting maximum of +64 percent.

[6] Standard used not stated.

[7] Systolic and diastolic, respectively, expressed in mm.

Examination of table 1 shows that the diverse factors of altitude, season of the year, climate, nature of the diet, and respiratory techniques employed all add to the complexity of any attempted comparison of the metabolic rates of these several Indian groups. According to table 2, the ranges and the averages in the ages, the heights, and the body weights of the several groups are, for the most part, much the same, although the male *Mapuche* and the male *Chippewa* were taller, the male *Mapuche* heavier, and the *Maya Quiché* laborers lighter in weight than were the other males. The mouth temperatures, insofar as such data have been recorded, were normal for basal conditions and comparable among the different groups. The respiration rates (table 3) of the Peruvian Indians and the *Maya* of Yucatán were, on the whole, within normal limits, although in some instances rates as low as 5 to 9 respirations per minute were noted.

The most striking features shown by the detailed data in the original publications, the ranges and the averages of which are summarized in table 3, are the relatively high metabolic rates of all the groups except the Peruvian, *Navaho*, and South Dakota Indians, the low pulse rates that were characteristic of many of the subjects, and the high blood pressures recorded in a few instances. These comparisons emphasize the need of further accumulation of data on pulse rate and blood pressure in any future studies of basal metabolism if explanations are to be obtained for the dissociation noted between pulse rate and metabolism and for the suggested correlation between high blood pressure and high metabolism. These comparisons raise the question as to why the Peruvian, *Navaho*, and South Dakota Indians have metabolic rates similar to the standards for North American Whites, whereas the *Mapuche* and the other Indians have higher rates. These higher rates are shown consistently by the majority of the subjects in these groups. Are the differences in the metabolic levels to be accounted for by inherent differences in the racial characteristics of these several groups of American Indians or are they to be explained by differences in external environmental factors, in experimental techniques, physical activity, character of diet, and the like?

The differences in the experimental techniques (see table 1) used in these studies can hardly be offered as an explanation of the differences noted in the metabolic rates, for both the Peruvian Indians and the *Mapuche* were studied with the same type of respiration apparatus, and yet the former show normal metabolic rates and the latter high rates. Furthermore, any inherent error in the experimental techniques would be too small to account for the difference in metabolic rates of, for example, +18 percent noted with male *Chippewa* Indians and −3 to +4 percent noted with the Peruvian soldiers.

All the subjects were apparently healthy and well nourished. Measurements were made of the sitting heights of the male *Mapuche* and the *Maya* of Yucatán, and from these measurements and the body weights the pelidisi (the Pirquet index of the state of nutrition) was calculated and found to be within normal limits. Possibility of a febrile condition due to malaria or some other tropical disease was ruled out in the *Maya* of Yucatán, for the mouth temperatures taken just prior to the metabolism measurements were somewhat below the accepted normal average of 98.6° F. The high metabolic rates noted with the *Maya Quiché* Indians of Guatemala might, however, be due to a functional abnormality. Crile and Quiring (1939 b) point out that there is a high incidence of diffuse endemic goiter throughout the region occupied by these Indians, that all the Indians except two studied by them were examined for goiter, and only in one was no evidence of goiter found. Certainly in any further research made to establish the metabolic rates characteristic of South American Indians and individuals of other races in other localities, each individual should undergo a thorough physical examination, to insure that only functionally normal subjects are used.

Climate, with particular reference to differences in prevailing outdoor temperature, relative humidity, and wind velocity (the *Chippewa* were studied outdoors) during the various seasons of the year when metabolism studies are made, is also a factor that cannot readily be eliminated in the comparison of these different Indian groups. Some investigators claim that the basal metabolism is lower in warm than in temperate climates, but others believe that the basal metabolism is independent of climate. The care with which Albagli has recorded climatological data in connection with the basal metabolism measurements he made in Rio de Janeiro, Brazil, could well be emulated by all investigators as a step toward resolving the role played by climate in the metabolism of different human races. Riddle (Steggerda and Benedict, 1932, p. 281) has suggested that the high metabolism of the *Maya* of Yucatán may reflect a temporary adjustment of the thyroid to offset the effects of extremely cool nights, for the *Maya* sleep inadequately protected by clothing against these cool nights. Climatological records show that the minimum temperatures in Chichén Itzá, when the second and third studies on the Yucatán *Maya* were made, averaged from 14.5° to 18.2° C. and in a few instances were as low as 8° to 10° C. But the majority of the observations in the first expedition were made in July, when the average minimum outdoor temperature was more nearly 20° C., and yet these July measurements also showed a high metabolism. The average outdoor temperature in Chile during the season of the year when the *Mapuche* were studied averaged 9.3° C., and the metabolic rates were high. The temperatures in Perú ranged from 12° to 25° C., and the Peruvian Indians had normal rates. The *Chippewa* faced extreme rigors of climate, yet they lived in tents the year round and failed to provide themselves with warm shelters or to clothe themselves properly. They are also among the Indians having high metabolic rates. As the evidence with regard to the effect of climate is conflicting, this suggestion of Riddle deserves further consideration.

Difference in altitude apparently does not account for the differences in the metabolic rates of the several Indian groups, for at sea level the rates are high for some groups and low for others, and the same is true at altitudes of from 2,300 to 4,000 m. (about 7,650 to 13,325 feet) (adapted individuals). However, it should be remembered that some individuals may not be adapted to high altitudes and consequently may have a low metabolism. Such individuals should not be included in any racial comparisons.

The high metabolic rates of the *Mapuche* of South America and the *Maya* of Yucatán cannot be ascribed to the stimulus of a high protein diet, for both groups ate little meat and their diets were poor in protein. The diet of the *Navaho*, on the other hand, is chiefly mutton (Carpenter and Steggerda, 1939), and yet their average metabolic rate is not high. The need for further comparisons of this nature is indicated.

Benedict and his coworkers point out that the customary life of hard labor of the *Maya* of Yucatán might in part (not wholly) account for their elevated metabolism. Great physical activity might also account to some extent for the high metabolism of the *Chippewa*, who led a nomadic life fishing and hunting, and of the *Maya Quiché*, who were soldiers or laborers on a coffee plantation. The Peruvian

Indians, on the other hand, who presumably also engaged in physical activity to a considerable degree, showed in general no increase in metabolic level above the standards. However, in a few instances high metabolic rates were noted by Hurtado among the soldiers studied at Santa Lucia, and he ascribes these to their active life in maneuvers.

Basal metabolism studies have been made on normal individuals in many different parts of the world. Many observers in subtropical and tropical parts of South America have noted metabolic rates somewhat lower, on the average, than the North American standards, at times markedly lower, but in no instance except that of the *Mapuche* has a general picture been recorded of a metabolic rate in South America appreciably above that for North American Whites. The researches of Benedict and his colleagues have given particular impetus to consideration of the role played by race itself. Many investigators now believe that race per se is a factor affecting the basal metabolism, along with the factors of age, weight, height, and sex. Williams and Benedict (1928) and G. D. Williams (1931) believe that there may be some correlation between the purity of the racial mixture and the metabolism. Many others believe that race is not a factor but that climate, undernutrition, and other factors explain the differences found in the metabolic rates of various human races. The divergence in the results of the two investigations on South American Indians thus far reported emphasizes anew the complexity of the study of the racial factor in metabolism and the need for additional studies on South American Indians.

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MESTIZOS OF SOUTH AMERICA

By MORRIS STEGGERDA

Before the Conquest of the South American continent, intertribal crossing among the Indians had been widely practiced. Even today, several relatively pure Indian tribes are crossing with one another to produce stocks of Indian hybrids. However, it was not until the coming of the Europeans, now nearly four centuries ago, that race crossing in South America began in earnest. With the establishment of the White race in South America came also the importation of large numbers of Negro slaves, as well as Chinese and East Indians, which further increased miscegenation. At the present time it may be said that South American Indians from every locality and members of every tribe have, to some degree, crossed with Europeans, Asiatics, and Africans to produce hybrids, collectively defined as Mestizos.[1]

Indians who have remained relatively pure may still be found in remote regions; similarly, it is true that one can still find Europeans in large cities who show no traces of interracial crossing with the Indian or Negro. Along the coastal regions of Brazil there are towns and cities in which are found large numbers of Negroes who may be considered racially pure. But for the most part, South America has become a "melting pot" of races.

Anthropometric studies on hybrids in South America are rare. The few data on Mestizo types are herein reviewed, but for the material on Mestizos in Brazil, where the subject has been most fully developed, the reader is referred to the following article by Pourchet (p. 111).

Perú.—In tropical Perú, Eberhardt (1910) noted that most of the tribes seemed to have become mixed with either Whites or Blacks, and that consequently many variations in skin color were evident, ranging from the very dark tribes of the Putumayo River region, in whom the author recognized strains of Negro blood, to the very light *Guarayú* ("*Huarayo*") of the Madre de Dios River, who, according to the author, might be the result of mixed Indian and Spanish ancestry.

Galt (1878) mentions that the offspring of matings between Spanish-Peruvians and the Indians of Highland Perú show a great general similarity to the Chinese, a resemblance which is chiefly found in the oblique position of the eyes, the shape of the nose, and the yellow-white complexion. This author also mentions that breadth of the chest and size of the lung case are greater among the mixed breeds.

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[1] Further data on racial demography will be found in Handbook, vol. 5, p. 655.

Hardy (1919) states that the mixed types in the Lowlands are lighter in color than the pure-blooded Indians, and lack their ruggedness of features. They are shorter in stature, less healthy, and show numerous signs of dissipation. The chola (half Indian, half Spanish) women of the Urubamba district are more attractive than their men, having more regular features, but they are inclined to obesity, a characteristic acquired from the mixture with Spanish blood.

Ferris (1916) says that the skin and the areola and periphery of the iris are distinctly lighter in mixed than in the pure *Quechua*. The facial hair is more strongly developed in the hybrids. Ferris measured 24 males, White-*Quechua* cross, and recorded these dimensions as:

	Cm.
Stature	158. 7
Sitting height	84. 2
Span	162. 3
Shoulder width	38. 2
Head length	18. 6
Head breadth	14. 6
Nasal index	82. 20

Rouma (1913) lists means for several measurements of individuals representing various crosses with *Quechua* (table 1).

TABLE 1.—*Mean measurements of various crosses with* Quechua (*from Rouma, 1913*)

Dimension	11♂ *Cholo*× *Quechua*	25♂ *Aymara*× *Quechua*	25♂ *Quechua*× *White*
	Mm.	*Mm.*	*Mm.*
Stature	1, 637	1, 609	1, 623
Sitting height	844	862	848
Span	1, 668	1, 639	1, 675
Chest girth	870	876	905
Head length	187	182	179
Head breadth	144	147	149
Cephalic index	77. 30	81. 40	83. 20
Nasal index	70. 70	70. 50	73. 50

The average stature of 10 male White-and-*Quechua* hybrids measured by Chervin (1907) was 1,618 mm., which agrees very closely with the mean given by Rouma.

Paraguay.—Stewart (1889) believed that there were no full-blood *Guaraní* in eastern Paraguay, and he noted that many of them showed Castilian features. He described the mixed races as a fine group, quite muscular and very active; the men are not tall, as a rule, but rather under the average height —5 feet 3 inches to 5 feet 5 inches.

Venezuela and the Antilles.—Generally speaking, the populations of the northern countries and the littoral regions of South America show a greater proportion of race mixture than those of the inland regions.

The Antilles are among the regions most affected by the admixture of Negro blood. The various ports in the Antilles were the receiving stations for countless cargoes of black slaves, imported by Portuguese, Spaniards, and Dutch, principally from the African Gold Coast. In most of these islands the pure Indian (*Carib*) has completely disappeared. In the Island of St. Vincent, there are still two types of *Carib*: (1) the red- or yellow-skinned, and (2) the *Black Carib*, a hybrid race, practically black, which resulted from a mixture of the yellow *Carib* with some of the African slaves (Hawtayne, 1886). These slaves were wrecked, about 1632, on the shores of Bequiá, an island close to St. Vincent. Eventually, the *Black Carib* settled on the leeward or northwestern coast, and the yellow or native tribes on the opposite side of the island. Hawtayne relates that the *Black Carib* became alarmed when African slaves continued to be imported by Europeans, lest their descendants might be mistaken for slaves and thus compelled to work. To prevent this, they introduced the practice of compressing the foreheads of all newborn children, so as to distinguish them from the pure African Negroes. This custom was abandoned a long time ago, but skulls with receding foreheads are still found. The *Black Carib* live at the foot of the Souffrière Mountain, in a small reservation granted them in 1805. In 1735 the black and yellow *Carib* together were estimated to number about 10,000, whereas in 1879 their number had shrunk to 431.

The Guianas.—According to Rodway (1912), the population of the Guianas is more varied than that of any other country in the world. Almost every race is represented, and mixed breeds are present in all possible combinations. It appears that the people living along the rivers are largely mixed—African, Indian, and European elements; Negro blood, however, seems to be most evident.

Ten Kate (1887) also mentions several groups of Mestizos living in the Guianas. One of these, the Karboergers, is found in Dutch and British Guiana. These Karboergers are said by this author to be the result of Negro male and mulatto female crosses, or of Negro, mulatto, or other Mestizo male and Indian female crosses. These last crosses are said to resemble Indians much more than they do Negroes.

Brazil.—Three principal basic racial stocks are responsible for the formation of the Brazilian population of today: White (Portuguese), Indian, and Negro (see p. 111).

Because of the frequent crossing and recrossing of Mestizos with secondary types, it is obvious that certain racial characteristics of Negro, White, and Indian are found in nearly all individuals, and precise ethnic origins are extremely difficult to determine.

Roquette-Pinto (1942), in writing about the non-Indians of Brazil, says that this population may be classified as follows:

	Percent
Whites	51
Mulattos (White×Negro)	22
Negroes	14
Caboclos (White×Indian)	11
Indians (not wild; possibly mixed—AUTHOR)	2

Actual body measurements on mixed breeds have been taken by few investigators. Bastos d'Avila (1937) lists several measurements taken on Indian tribal crosses. He discusses a cross between two important linguistic groups: the *Arawak*, represented by *Wapishana* individuals, and the *Carib*, represented by *Macushí*. The dimensions, as recorded by Braulino (1929), for 5 adult hybrid females and compared with pure *Wapishana* and pure *Macushí* females, are given in table 2.

TABLE 2.—*Comparative measurements of Wapishana×Macushí cross and pure Wapishana and pure Macushí (from Braulino,* 1929)

Dimension	Adult female (5) *Wapishana ×Macushí* cross	Adult female pure *Wapishana*	Adult female pure *Macushí*
	Cm.	*Cm.*	*Cm.*
Average stature	150.6	151.4	147.9
Weight (kg.)	51.25	52.80	50.25
Trunk height	77.1	77.0	77.4
Chest girth	83.2	85.8	84.6
Head girth	52.6	52.0	52.8
Horizontal cephalic index	83.8	80.2	82.8
Vertical cephalic index	78.5	86.7	84.6
Bizygomatic breadth	11.3	10.6	10.5
Nasal index	76.9	64.8	74.1

Discussion.—From a review of the anthropological literature on Indians, Whites, and Mestizos of South America, it seems apparent that this area is richer in genetic crosses than most parts of the world. Most studies in race crossing up to the present time have been made with mass statistics, which, as a rule, obscure rather than illuminate the problem. When real F_1 hybrids and their parents are available, as is true in many parts of South America, the analyses of such individual families should result in producing information in the study of human genetics.

The study of race crossing is most satisfactory when widely divergent races enter into the original cross. Thus, Negro-White hybrids make excellent material for study, if pure Negroes and homogeneous Whites mated and produced children. For such studies in North America, the first obstacle, and perhaps the most important one, is that there are practically no pure Negroes, all of them having mixed, to some extent, with Whites and Indians. The second obstacle is that most matings between Negroes and Whites are surrounded by moral stigmata and social barriers to such an extent that a complete study is difficult to carry out. Finally, it has been found that the light-colored individuals resulting from various crosses wish to pass for Whites, which makes it most difficult to win their cooperation in such a study.

In South America, these racial barriers do not exist to such an extent; and, therefore, such investigations may be carried out more satisfactorily. Race crossings are, perhaps, more complex in South America than they are in North America; and the study of Indian-Negro-White crosses may be followed up by that of other hybrid groups, such as, for example, White and Chinese, White and East Indian, and the like. Such diversified combinations of races offer an extensive field for the study of physical traits appearing in the hybrid offspring of parents who are of different racial origin.

Stature and general body build may not always be affected by a cross between the representatives of two different racial stocks; but such traits as eye color, hair color and hair form, and pigmentation of the skin may offer unmistakable evidence of hybridization. Neither eye color nor hair form has been studied adequately in hybrid races, because of technical difficulties encountered in grading eye color and in sectioning human hair. But these difficulties can be overcome. Dermatoglyphic patterns have been found to run true to type in representatives of distinct racial stocks. Finger, palm, and sole-print patterns do not change throughout life; and there is strong evidence that Indians, Chinese, Negroes, and Whites show different dermatoglyphic patterns when compared with one another, so that this characteristic too may become of assistance in determining racial origins.

Furthermore, there are other physical characteristics which are strongly influenced by the crossing of races, such as ratios of the extremities, nasal index, cephalic index, and so forth. A genetic approach to this important problem of race crossing not only may shed light on the physical and mental fitness of each particular hybrid group and on its adaptability to a given environment, but also may result in a better understanding of the fundamental motives in race crossing.

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BRAZILIAN MESTIZO TYPES

By Maria Julia Pourchet

Since the second half of the 16th century, intermarriage has been going on between representatives of the three basic races of Brazil: the Portuguese colonizers and later on Spanish, Italian, and German elements; the aborigines; and the Negroes, who were subsequently imported as slaves. An intense process of interbreeding, due to this peculiar ethnic set-up, is creating the most varied types of Mestizos, since the proportions in which the different ethnic strains were crossed are also varied.

An extensive sociological bibliography was started by Euclides da Cunha and was continued by Gilberto Freyre and disciples of these two great masters. It contains accurate studies of temperament, affinities, tendencies, practices, customs, and traditions of those products of interbreeding. Studies of physical anthropology, however, have received less attention despite the enormous variety of physical types which challenges investigators. What appears immediately obvious is that the Mestizo population shows no signs of degeneracy, and what was unjustly attributed to miscegenation has been proved beyond a shadow of a doubt to have been determined by causes linked with social factors which today have been fortunately recognized and duly evaluated.

The crossing of Black and White is closely linked with the economic-social formation of Brazil and first received the attention of anthropologists. The crossing of White and Indian which preceded it began only recently to be the object of more accurate investigations and the contributions devoted to its study have been few indeed. Sá e Oliveira in Bahia seems to have been the first to have made comparative scientific investigations of the physical peculiarities exhibited by the mulatto, crióulo, caboclo, and Whites of Bahia (Sá e Oliveira, 1895). Craniometric features of the different Mestizo groups in Brazil have been recorded, and although the number of crania studied was slight, we must recognize the precision of the anthropometric technique used. A series of general considerations on the problem of interbreeding in his time occupied the attention of the Director of the Faculdade Médica of Bahia, who recorded the existence of various products of interbreeding, including the Bahia Whites, especially those of the lower social classes, as a type more or less mixed with African or indigenous blood (Roquette-Pinto, 1923).

Believing in the destiny of the products of interbreeding, he foresaw, however, a great lapse of time before the firm and perfect union of the characteristic lines takes place; social prejudices and organic aptitudes, under the influence of our climate and other influences will establish the most favorable selection, parallel with the evolutionary development of the organisms.

Such in general are the ideas of the Bahian scholar.

The White-Indian-Negro crossing is responsible for the majority of the so-called sertanejo type, which has been clamoring for the earliest possible anthropological study. Although Negro influence was slight in Ceará where exploitation of Indian manpower was more favorable, in other regions of the northeast there was present, on the contrary, a large percentage of Negro blood, especially in the northeast characterized by latifundia, the land of the casa grande and the senzala (the big house and the slave quarters). Here, contact between White European colonizers and the colored races was the result of two social factors, the monoculture characteristic of the latifundia and the scarcity of White women among the arrivals (Freyre, 1934, p. 74).

Products of interbreeding begin to arise then. They first resulted in equal proportions of White and Negro blood and afterward in the most varied proportions. These Mestizos constituted the favorite material for chroniclers and historians of the period, who regarded the novel reactions of those "sui-generis" peoples as a spectacle new to their eyes and to their point of view as Whites, Europeans, and civilized men. First of all, it seemed to them that miscegenation affected robustness and physical efficiency, and that it was the cause of a lack of dynamic energy and of disharmony in the physical type. They were probably neither the first nor the last to form snap judgments. Our sociologists, however, are proving that deeper causes of a social order linked to diet—causes and not cause—probably produced that first impression. These causes include insufficient and poorly balanced diet and a patriarchal regime based on slavery—deteriorating factors to which might be added the influence of the milieu, those geophysical conditions which modern studies are clarifying. A hypopituitary condition linked to a hypoadrenal condition seems to have been determined by the adaptation of glands to the new milieu. The brackish water which the Mestizos drank and the salty food they ate, in other words an excess of chlorides, which determined a low activity of the adrenal cortex, created a rather intense activity (Bastos d'Avila, 1940 a, p. 131).

The physical type also was probably strongly marked—a stocky stature or, if we wished to go further, that frequent occurrence of brevilinear types which we can surmise from the description of the chroniclers of the times: dark complexion, short and thick neck, an almost waistless trunk, and a prominent abdomen.

Assuming the responsibility of the milieu for the physical types to be found in the northeast (State of Pernambuco), two investigators made comparative studies of various ethnic groups (white skins [leucodermos], dusky skins [faiodermos], and black skins [melanodermos]) functioning in three regions: the littoral, the intermediate country, and the hinterland. Unfortunately, the yellow skins, xantodermos (result of White and Indian crossing), were ignored (Ferraz and Lima Junior, 1939, pp. 277–317).

According to the techniques of the constitutionalist school, Viola's method, each one of the groups was studied in each one of the three regions, and the authors arrived at the following general conclusions: In each of the ethnic groups, those who dwelt along the littoral are predominantly longilinear; in the intermediate zone (mata e agreste) the brevilinear varieties predominate; in the hinterland zone the longilinear type again predominates, which may be attributed to greater or lesser thyroid activity and to food rich in or lacking in iodine. The excess of manioc flour, beans, rice, and tortillas is probably responsible for the incidence of brevilinear types in the intermediate zone.

Miscegenation was just as great in the State of Bahia, with the White and Black crossing predominating at the beginning. Later on, however, in several parts of the state, there was an increase in Indian-Negro mixed breeds (the latter had fled from the littoral and taken refuge in quilombos), or the crossing of caboclos with Negroes, giving rise to cafusos, in whom the proportions of one blood and the other are variable.

During our investigations with colored children in Bahia, we used the genealogical method for the first time. In a regular number of cases we discovered the mixture of three bloods: White, Black, and Indian. We did not have enough time to analyze the influence of Indian blood in the distribution of morphological traces. Therefore, we restricted ourselves exclusively to the White-Negro crossing. According to the personal testimony of several investigators (Artur Ramos, Edison Carneiro), cafusos (Negro-Indian) are frequently found in cities of the interior.

In the central state of Minas Gerais, contact between Whites and Mestizos has been increased; the latter, in turn, resulting from previous crossings (Senna, 1922, p. 208). This has been going on since the penetration of the bandeirantes and the sertanistas paulistanos from south to north and before them, the entradas coming from the Bahian coast and going east and northeast. The crossing and recrossing was intense: the Paulista, product of Portuguese-Spanish-Indian crossing, the mameluco (crossing of White and Indian), the curiboca or cafuso (crossing of indigenous blood with African).

The history of the settling (povoamento) of Minas Gerais, which is intimately linked with the history of the Paulista people, was built around this amalgamation (caldeamento). In the 17th and 18th centuries, the people of Minas Gerais was already composed of a "strong and helter-skelter ethic mixture": Whites, Mestizos, Indians, and Negroes. Among the Mestizos there were mulattos, cabras, bastards, curibocas, caboclos, and pardos, resulting from Negro-White, Indian-White, and Indian-Negro crossings. But miscegenation continues and the three bloods flow together forming the most varied series of products of crossing for which the above cited author demands anthropophysical and social study. In the State of Minas Gerais they are called by a great variety of names: capiáus, biribas, tabaréus, peoes, jaguncos, etc.

With the exception of several general observations, we do not know of any contribution to the physical anthropology of these peoples, even though that lacuna is making itself strongly felt.

The principal fields deserving the study of race crossings are the types in wooded regions (matas) of the Rio Doce and in the bush (brenhas) of the Mucury and Itambacary Rivers, the gorutubano cowboys (vaqueiros) of the Nortista sertões of the Jahyba River, the wiry and muscular sertanejos of the banks of the São Francisco and Jequitinhonha Rivers, and the ox drivers (boiadeiros) of the west and of the Triangle between the Paranahyba and Grande Rivers (Senna, 1922, pp. 222–226).

Escaped Negroes in 1721 and 1725 who had rebelled against their overseer (dominador) sought refuge in quilombos in the neighborhood of native tribes. As far as we know, the latter were the *Aimoré* tribes of the Mucury River and the *Botocudo* of the Doce River, with whom they intermarried and created cafusos. The anthropological characteristics of those mixed types were, according to the description of chroniclers of the period, more or less the following: Almost black, dark coloring of the epidermis, copper color or coffee-brown; small though narrow feet, muscular, especially in the chest and the upper limbs; more Negroid than Indian in appearance; oval face with prominent cheek bones; broad nose; lips not thick; black eyes; characteristic high frizzled hair, as though it had been artificially raised, reminiscent of the *Papuans* of New Guinea (Roquette-Pinto, 1915, p. 51).

The Euro-American crossing which has been going on in the Paulista Plateau since the middle of the 16th century, giving rise to the first generation of mamelucos, is closely bound with the history of the bandeirante movement. The history of bandeirantismo appears to to be closely linked with the mamelucos and their incomparable attributes of "great fecundity, magnificent longevity, and amazing virility."

Relations of cause and effect between bandeira and interbreeding are being brilliantly debated by our historians, and according to them interbreeding operated in the following manner (Ellis, 1936, p. 53): (1) Unions legalized by marriage between a White man and an Indian woman, or between the latter and a mameluco. (2) Illegal union between the White or the mameluco and the Indian woman, equivalent to American common-law marriage. (3) Fortuitous and accidental unions between the White or the mameluco and the Indian woman, who was sometimes secretly sold. These unions produced an immense number of bastards.

Concerning the fecundity and longevity of the products of Ibero-American crossing, which took place in the 16th and 17th centuries on the Paulista Plateau, documents of the period which patient historians are collecting treat them expressively (Ellis, 1936, pp. 77–83)

There is a terrific dispute raging among historians of bandeirantismo concerning the presence of Negroes in the bandeirante movement. Historical reasons, in the light of reliable documents, lead us to believe that "whites, Indians, and Negroes all participated in the bandeira" (Ricardo, 1942, 2: 61). The bandeira, the first collective product of Euro-Amerindian interbreeding, probably gave rise afterward to other ethnic crossings: cafusos, mulattoes, and mamelucos were probably the results. Many a cafuso was probably the result of marriage between Negroes and Indians. Some of these unions were legally sanctioned by the action of the Jesuit missionaries; others, illicitly, were the consequence of the rape of Indian women by Negroes who fled from the bandeiras.

The existence of cafusos, cabras, mamelucos, forros Indians, and Negroes is attributed to the amazing and rapid penetration of the sertões by the bandeirantes in the south and the criadores in the north (Oliveira Vianna, 1938, p. 93).

The bandeirante movement and the conquest of Amazonas were the accomplishments of Mestizos.

Among the contributions to the physical anthropological study of our present Mestizo population the most important are those carried on by the Serviço de Saúde of the Army and by the Laboratorio de Antropologia of the Museu Nacional. Among the former must be reckoned the studies of Murillo Campos, Romeiro da Roza, and Arthur Lobo da Silva. The latter are linked with the name of Roquette-Pinto, who greatly stimulated anthropological studies in Brazil. In all of these contributions we shall analyze the data referring to the different ethnic groups, point out the differences, and sum up the conclusions of each investigator.

In studying different ethnic groups—Whites, caboclos, Mestizos, and Blacks—Murillo de Campos expresses the opinion that distinctions between curiboca or cafuso Mestizos, mamelucos, and mulattoes are becoming more and more difficult to establish because a careful study frequently reveals stigmata of the three races in the same individual (Campos, 1919, vols. 9–12, pp. 1 ff.). His investigation of cephalic, facial, and nasal indices led to the following results:

Ethnic group:	*Cephalic index*	*Nasal index*	*Facial index*
White	78. 9	50. 3	92. 8
Mestizos	79. 0	66. 7	95. 9
Caboclos	83. 7	61. 1	90. 9
Blacks	79. 7	70. 7	88. 8

For height, chest measurement, weight, and Pignet index the results encountered in the four groups are as follows:

Ethnic group:	*Height (cm.)*	*Weight (grs.)*	*Chest measurement (mm.)*	*Pignet index*
Whites	166	56, 300	816	28. 5
Mestizos	165	57, 100	824	25. 1
Caboclos	162	56, 200	821	23. 5
Blacks	167	63, 000	817	27. 1

Data were also collected referring to the average shoulder and pelvic girdle measurements and to the dynamometric force.

In conclusion Campos (1919) states that the Brazilian Mestizo is in general the result of the fusion of three races and that his supposed inferiority is a problem for preventive and social medicine rather than of racial genetics proper.

A regional investigation conducted with a group selected from the wooded zone (Minas Gerais) based upon 290 individuals, most of whom were 21 years old, yields data concerning height, chest measurement, and weight (Romeiro da Roza, 1920, pp. 53–61).

Under the heading "Mestizos" were included all the products of crossing in whom it was difficult to ascertain racial origins, although the author does not have the slightest doubt in affirming that there was a high percentage of individuals who had aboriginal ancestors.

The results for the different groups were as follows:

Ethnic group:	*Height (mm.)*	*Weight (grs.)*	*Chest measurement (mm.)*	*Pignet index*
White	1, 670	55, 100	863	25. 6
Mestizo	1, 656	55, 300	861	24. 2
Black	1, 681	59, 000	866	22. 5

Proportionate to their height, the Mestizos had the finest chest measurements.

In regard to the Pignet index an important discovery was made according to which the Mestizos had a higher average than the Whites, a fact which is pointed out by the author as disproving the bruited physical inferiority of the Mestizo.

In an excerpt from the Report of the Secção de Antropologia of the Museu Nacional, Roquette-Pinto presents data concerning 600 females and 1,127 males, from every State in Brazil and from 21 to 25 years of age.

Each ethnic group was studied from the point of view of regional distribution, including three zones: the northern states, the central states, and the southern states.

For the caboclos the regional variation was:

Caboclos:	*Height (mm.)*	*Cephalic index*	*Nasal index*
Southern	1, 690	79. 36	70. 00
Central	1, 656	80. 10	66. 03
Northern	1, 633	83. 15	66. 66

In our opinion, the differences revealed are quite important and a physical anthropological study of the indigenous groups of the region would clarify the matter (Roquette-Pinto, 1923, p. 30). To sum it up, we will analyze the two most important investigations made to date, which, by a happy coincidence, constitute all of volume 30 of the Arquivos do Museu Nacional (Lobo da Silva, 1928; Roquette-Pinto, 1928). The first and main work contains original abundant data—38,675 files on young men from 20 to 22 years of age, gathered in all the States of the Brazilian Federation. In addition, the files were divided according to region: the States were separated into three groups, taking into account not only the geographical position but certain analogies between them as well.

The first group includes the States of the interior without a coast line and localized on the central plateau of Brazil; the second is the northern group from Amazonas to Bahia inclusive; the third extends from Espírito Santo to Rio Grande do Sul.

The caboclos presented the greatest variation in height, greater in the south than in the north. The caboclos had the greatest chest measurements, the Mestizos being next. In regional distribution, the northern caboclos were more favored than the others.

Despite its complete lack of biological significance, the Pignet index was the only one used. The caboclos had the best indices, as Romeiro da Roza has already discovered in his investigation with individuals selected from the forest region.

Finally, we shall comment upon the work of Roquette-Pinto which has been incorporated in the now classic work, "Nota sobre os ytpos antropologicos do Brasil." This Brazilian scholar, who has been concerned for a long time with the problems of our peoples, uses data collected for about 20 years. Because of accusations launched against our Mestizos from Aryan sources, he always takes pains to verify "whether their anthropological characteristics show signs of anatomical or physiological decadence." The data were gathered from young men hailing from every State, sons and grandsons of Brazilians, all healthy and subject to the same living conditions, and for this collection of data Martin's technique was used.

For this study we will select for analysis the two groups resulting from crossing, dusky skins (White and Negro) and yellow skins (White and Indian).

Unfortunately, the other products of crossing, cafusos and caborés, were numerically unimportant and were not analyzed; according to calculations made by the Museu Nacional in 1922, the percentage of mulattoes and caboclos was, respectively, 22 percent and 11 percent of the Brazilian population.

The anthropometric data considered were: Weight; height; facial height; cephalic and nasal indices; color of the skin, of the hair, and of the eyes; and type of hair. For Brazilian dusky skins (Negro-White crossing), Roquette-Pinto found that they were predominantly around 1.64 m. tall and less frequently around 1.73 m. The cephalic index clusters around 78, which is mesocephalic. The nasal index is predominantly leptorrhine.

To sum it up:

> The mulattos of Brazil form a group which is not homogeneous. Among them there is a marked tendency toward the White race which many of them approach by different characteristics. None of the characteristics studied (height, cephalic and nasal indices, chest measurement, length of the face, bizygomatic breadth, life span) lead us to consider them as involuted types. [Roquette-Pinto, 1928.]

In conclusion, dusky skinned Brazilians may be characterized as follows:

> Individuals of brown skin, more or less dark (Nos. 20 to 30 on the Von Luschan scale), dark eyes (black or brown) and ulotrichous hair; medium height; mesocephalic, mesorrhine, narrow face. [Roquette-Pinto, 1928.]

In the xanthodermic group (resulting from White-Indian crossing), height clusters around 2 points, 1.63 m. and 1.69 m., visibly veering toward the latter.

The *Tupí*, *Arawak*, and *Carib* of the far north, some *Ge* from the south of Bahia and from Minas Gerais made the greatest contributions to those crossed groups whose height varies from 158 cms. to 164 cms. The *Bororo* (173 cms.), *Carajá* (168 cms.), and *Nahukwa* (168 cms.) had little influence in the crossing. White blood seems to be responsible for the relatively tall height of some of our caboclos.

A leptorrhine nasal index indicates a strong White influence. Strong brachyfacial characteristics predominated.

In this, as in other investigations, the relatively high chest measurement is noted. This characteristic gives our caboclos an appearance of physical robustness which so many chroniclers have remarked upon. The brachycephalic index, which is quite homogeneous, is higher than that of the White skins.

Roquette-Pinto made a résumé of the following occurrence of characteristics in those products of crossing: Skin 20 to 30 on the Von Luschan scale; black hair, lissotrichous; dark eyes, at times with the palpebral fold slightly oblique; short, broad face; medium or low stature; brachycephalic; leptorrhine or mesorrhine.

After analyzing the physical anthropological data of the different groups, the Brazilian investigator Freyre arrives at the following general conclusions:

> From the physiological point of view the investigations proved that intermarriage between White and Negro, and White and Indian always result in normal types, unless the progenitors are carriers of morbid heredity. The habit of considering Mestizos who are only ill or disgenicos as degenerate has been common among those who are violently opposed to miscegenation. The fact is that this confusion in attributing responsibility must be removed. All we need is to recall the case of Ceará, where the greatest number of intermarriages took place between white skins and yellow skins. The vitality of the races was in no way affected by the crossings. The physical resistance and moral vigor of the conquerors of Amazonia (northeastern Mestizos) who overcame every obstacle is absolute proof. We already referred to this when comparing it with the tenacity of the bandeirantes.
>
> Everything leads us to believe that miscegenation was a valuable contributing factor in the formation of the Brazilian, creating that ideal type of the modern man for the Tropics, the European with Negro or Indian blood to revive his energy. [Freyre, 1934, p. 74.]

Despite the small number of anthropological investigations concerning the present Mestizo Brazilian peoples (in the present work we considered by preference the results of White and Indian crossing), neither here nor anywhere else did intermarriage cause degeneracy save in those cases where unfavorable individual conditions entered into the picture.

The evaluation of a human group should be made in the light of their achievements, and in Brazil, if nothing else were to speak in its favor, the two great sertanista movements, the conquest of Amazonia and the bandeirante penetration would prove that miscegenation has been advantageous rather than prejudicial.

More accurate studies should be made in the meanwhile falling into the three following categories: (1) The evaluation of variability of the morphological traces of groups resulting from crossing. (2) A constant observation of the reactions of the present Mestizo peoples of Brazil. (3) The adoption of a genealogical method in certain regions wherever it is possible to do so, particularly in order to throw light on the little-known subject of crossings of White with Indian, resulting in caboclos, and of Negro with Indian, resulting in cafusos.

The study of the present Brazilian Mestizo peoples is therefore deserving of accurate investigation using the most modern scientific methods.

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THE PHYSICAL ANTHROPOLOGY OF CHILE

THE ANTHROPOMETRY OF THE INDIANS OF CHILE

By CARLOS HENCKEL

The present study presents a brief summary of the physical anthropology of the Indians of Chile who survive as ethnic groups at the present day. It does not take into account the Chilean Indians who have disappeared, either through becoming mixed or absorbed in the White population.

The extreme south of the continent of South America was occupied by three ethnic groups, the *Ona* (*Shelknam*), the *Yahgan* (*Yamana*), and the *Alacaluf* (*Halakwulup*).[1]

THE ONA (SHELKNAM)

In pre-Columbian times the *Ona* occupied the large island of Tierra del Fuego but today are reduced to a very few individuals who live around Lake Fagnani, some of them in the Salesian Mission of Rio Grande. They numbered 276 persons in 1919 (Gusinde, 1939), 110 in 1931 (Rahm, 1931 a), and scarcely three dozen in 1938 (Gusinde, 1939).

SOMATOLOGY

Numerous observations have been made of the physical appearance of the *Ona* (Sarmiento de Gamboa, 1768; Banks, 1896; Darwin, 1875; Fitz-Roy, 1839; Serrano, R., 1880; Lista, 1887; Segers, 1891; Nordenskiöld, 1896; Wieghardt, 1896; Cook, F. A., 1900; Outes, 1909; Gallardo, 1910; Canas, 1911 b; Dabbene, 1911; Furlong, C. W., 1917 a; Barclay, 1926; Lothrop, 1928; Serrano, A., 1930; but complete studies using modern methods have been made only by Lahille (1926), Lehmann-Nitsche (1916 b, 1927), and Gusinde (1922 a, 1922 b, 1922 c, 1924, 1926 a, 1932, 1939), who with Lebzelter followed Martin's anthropometric techniques (Martin, 1928).

Early writers called attention to the tallness of the *Ona*. Lehmann-Nitsche found that 20 men had a mean stature of 174.1 cm. (168.0–183.7) and 30 women of 159.6 cm. (149.0–168.3). Gusinde's results were similar: 24 men, 172.9 cm. (163.1–180.9), and 22 women, 160.3 cm. (153.7–166.9).

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[1] See Cooper, 1917 a, for a complete bibliography of the physical anthropology and ethnography of these Fuegian tribes.

The *Ona* head is large and rugged (pl. 24, *top, left,* and *bottom, right*). The horizontal circumference is considerable: men, 590 cm.; women, 574 cm. (Gusinde); or men, 583.5 cm.; women 563.7 cm. (Lehmann-Nitsche).

The maximum longitudinal diameter of the head is great: men, 199 mm.; women, 190 mm. (Gusinde); so is the maximum transverse diameter: men, 158 mm.; women, 152 mm. The average horizontal cephalic index is 78.8 for men, 79.8 for women (Gusinde); or 79.6 for men, 80.5 for women (Lehmann-Nitsche). This is mesocephaly approaching the lower limit of brachycephaly.

The face is oval, the cheek bones wide and prominent. The average morphological height of the face is: men, 124 mm.; women, 117 mm. The bizygomatic breadth has a mean of 150 mm. for men, 142 for women. The facial index shows euryprosopy: men, 82.7; women, 82.2 (Gusinde).

The nose is large, straight, sometimes slightly aquiline, and leptorrhinic. The mean nasal index is: men, 67.5; women, 68.8 (Gusinde).

The forehead is low owing to the down growth of the hair toward the orbits. The eye opening is small, somewhat oblique, and almond-shaped. All the *Ona* have a transverse fold of the upper eyelid (plica palpebralis media) and most of them a marginal fold (plica nasomarginalis). The eye color almost always corresponds to number 2 or 3 of R. Martin's color chart.

The mouth opening is large and the lips are thin. The naso-labial furrow is well marked, especially in persons of some age. The chin is massive and there is always a furrow between it and the lower lip.

According to Gusinde's detailed description of the ear (1926), in the lower half of the external ear the helix is outstanding for its considerable thickness. The tragus and antitragus are especially massive.

The neck is regular, and the trunk is broad and strong (pl. 24, *bottom, left.*) The biacromial width has a mean of 438 mm. in men, 403 mm. in women (Gusinde). The length of the trunk has a mean value of 533 mm. in men, 508 mm. in women (Gusinde). Due to the great development of the thorax, the circumference of the chest is great; Gusinde found an average of 100.8 cm. in 15 men.

The arms are strong, well formed, and muscular. The average length of the arm is 783 mm. for men, 692 mm. for women (Lehmann-Nitsche). The hands are small and well formed (Lehmann-Nitsche, 1904 d).

The legs are thin in the calf, thick in the thigh. The total average length of the leg is 921 mm. or 53.2 percent of the total stature in men, 849 mm. or 52 percent in women. The feet are small and well formed.

The skin is a brownish yellow, relatively clear, and corresponds to Nos. 10 and 11 of Von Luschan's color chart.

The hair is dark and blackish. The hairs are straight, strong and thick. (For details, see Saller, 1939.) The beard has very few hairs. Hairs are extremely sparse in the armpits and in the pubic region.

CRANIOLOGY AND OSTEOLOGY

For the craniology of the *Ona* see Hultkrantz (1907), Lebzelter (1925), Hilden (1930), and Gusinde (1939).

According to Gusinde, who has studied the greatest amount of material to date, the average cranial capacity is 1,480 cc. in males and 1,356 cc. in females. These figures correspond to the aristencephaly of Sarasin.

The greatest cranial length (pl. 25) is 192 mm. in males, 184 mm. in females; the width, 143 mm. and 137 mm., respectively. The horizontal cranial index has a mean of 74.5 for males, 74.9 for females (Gusinde), indicating dolichocrany approaching mesocrany. The mean basio-bregmatic height is 136 mm. for males, 135 mm. for females (Gusinde). The auricular height is 116 mm. and 114 mm., respectively. The vertico-longitudinal index is 70.9 and 73.4, respectively, showing medium orthocrany.

To judge by Gusinde's median values, the *Ona* may be classified as follows: Metrio- to acrocranic, according to the vertico-transverse index (men, 95.1; women, 98.7); orthocranic, according to the index of auricular height in relation to cranial length (males, 60.3; females, 62.0); steno- to metriometopic, according to the fronto-parietal index (males, 65.5; females, 67.4).

The average angle of frontal inclination of the *Ona* is only 48°. The forehead is low and retreating. There is an almost complete absence of lateral frontal protuberances. A supraorbital torus is common; also a sagittal crest (lophocephaly). The muscular relief of the occiput is well marked, and in most cases amounts to a torus.

Mean facial dimensions of the skull (Gusinde) are: Morphological height of the face, males, 126 mm., females, 127 mm.; bizygomatic width, males, 144 mm., females, 138 mm.; facial index, 87.2 and 91.8, indicating meso- to leptoprosopy; superior facial index, males, 52.7, females, 55.3, indicating meseny or a slight lepteny. The angle of total profile in skulls of both sexes is 84°, which is near the upper limit of mesognathy and close to orthognathy.

The orbital index, 92.4 for males and 82.3 for females, shows that most skulls are mesoconchic. The nasal index shows that males are leptorrhinic (45.9) and females slightly mesorrhinic (47.1). The mean palatal index, 76.6 for males, 80.1 for females, is leptostaphylinic or slightly mesostaphylinic (Gusinde). All skulls show a palatal torus.

The mandible is very massive, the mean bicondylar width being 127 mm. for men, 122 mm. for women.

Ona teeth are considerably worn, but caries occurs only rarely.

For other *Ona* skeletal characteristics, see Hultkrantz (1907).

THE YAHGAN (YAMANA)

The *Yahgan* lived in the region included between Slogget Bay on the point southeast of Isla Grande, the Peninsula of Brecknock, and Cape Hornos. Today, only some 24 persons survive, living in the village of Mejillones on the Island of Navarino (Gusinde, 1939).

SOMATOLOGY

There are many descriptions and observations concerning *Yahgan* somatology: Abel (1934), Bove (1882), Bridges (1893), Colvocoresses (1852), Darwin (1875), Forster (1843), Fitz-Roy (1839), Gusinde (1939), King (1839), Hyades and Deniker (1891), Lehmann-Nitsche (1916 c), Martial (1888), Saller (1939), Spegazzini (1882), Snow (1857), Webster (1834), Weddell (1827), and Wilkes (1844).

The stature of the *Yahgan* is relatively short. Various mean heights recorded are:

Men	*Women*	*Author*
157.4	147.5	Bove, 1883.
158.9	148.1	Bove, 1882–83.
158.7	149.4	Martial, 1888.
158.7	147.1	Hahn, 1883.
157.2	147.4	Hyades and Deniker, 1891.
160.0	147.8	Gusinde, 1939.
158.5	149.0	Dabbene, 1911.

The head is large and of great capacity (pl. 24, *top*, *right*). The mean maximum head length is 190 mm. for men, 180 mm. for women (Hyades and Deniker, 1891), or 197 mm. and 186 mm., respectively (Gusinde, 1939). The greatest mean width of the head is 151 mm. for men, 142 mm. for women (Hyades and Deniker); or 155 mm. and 150 mm., respectively (Gusinde).

The horizontal cephalic index is 79.6 for men, 79.1 for women (Hyades and Deniker), or 78.6 and 80.8 (Gusinde). The *Yahgan* are thus mainly mesocephalic, with a slight tendency to brachycephaly.

The face (pl. 27, *top*, *left*) is generally ovaloid, somestimes round, but always angular with prominent cheekbones. The morphological height of the face has a mean value of 118 mm. in men, 116 mm. in women; the bizygomatic width has a mean of 150 mm. for men, 141 mm. for women. The facial index of 78.7 for men is hypereuryprosopic and 82.4 for women is euryprosopic. The superior facial index of 48.2 for men and 50.1 for women indicates meseny for both sexes (Gusinde, 1939).

The *Yahgan* forehead is low, narrow, and retreating. The superciliary ridges are well developed, the frontal torus being conspicuous. The front limit of the head hair is very near the orbits. The nose is relatively narrow between the eyes, while farther down it is wide. The nasal profile is generally concave, and in rare cases straight. The nasal index, 77.1 for men, 74.2 for women, is mesorrhinic.

The eyes are rather small. The opening between the lids is generally spindle-shaped. The upper lid has a transverse fold, and in some cases there is also a marginal fold. The color of the iris corresponds to number 2 or 3 on Martin's color chart.

The mouth is large and the lips generally medium thick, but there are individuals both with thin and very thick lips. The upper lip almost always protrudes. The chin is quite massive.

The neck is short and thick. The body is massive and cylindrical, and in adults almost without a waistline. The mean trunk length is 490 mm. for men, 472 mm. for women, and the biacromial width is 392 mm. and 371 mm., respectively (Gusinde). The circumference of the thorax is considerable: a mean of 92.3 cm. for men, 85.8 cm. for women (Hyades and Deniker). The mean ratio of the circumference of the thorax to the stature is 58.7 percent for the two sexes.

The arms are well formed and muscular. The mean total length is 72.5 cm. for men, 65.0 cm. for women (Gusinde). The hands are small.

The legs are very weakly developed. The total leg length has a mean value of 85.2 cm. for men, 74.9 cm. for women, which is 53.2 percent and 51.2 percent, respectively, of the total stature (Gusinde). The "atrophy" of the legs, of which Hyades and Deniker speak, is caused by the custom of spending a great deal of time in canoes, paddling or fishing, and is not an hereditary characteristic (Gusinde).

The skin color is somewhat dark. In most individuals, it is clearer than Nos. 10, 11, and 12 of Von Luschan's color chart, but these tints are also observed.

The hair is abundant, stiff, and generally straight, although wavy hair is seen on some persons. According to Spegazzini (1882), the *Yahgan* have no body hair, and only the old men have a few hairs on the upper lip and chin. In the armpits and pubic region there are very few hairs. The hair color is very black. (For details, see Saller, 1939.)

CRANIOLOGY AND OSTEOLOGY

Yahgan craniology has been dealt with by Garson (1885), Gusinde (1939), Hilden (1930, 1931), Hultkrantz (1907), Hyades and Deniker (1891), Ten Kate (1904), Mantegazza and Regalia (1886), Owen (1853), G. Sergi (1887), and Vignati (1927 b). The following measurements are mean values from Gusinde, who has examined the greatest amount of Fuegian cranial material to date:

The cranial capacity of males is 1,432 cc. and of females is 1,290 cc., indicating euencephaly (Sarasin).

The greatest skull length is 186 mm. for males, 177 mm. for females (pl. 26, *top*), which is considerably less than for the *Ona*, whereas the greatest width is scarcely different, being 142 mm. for males, 136 mm. for females. The horizontal cranial index is 76.6 for male skulls, 77.0 for female, which is mesocranic and approximately two points higher than for the *Ona*. The basio-bregmatic height reaches 136 mm. in men, 131 mm. in women, and the auricular height 115 mm. and 112 mm., respectively. The vertico-longitudinal index is 73.6 and 74.1, corresponding to mesocrany.

According to the vertico-transverse index of 96.1 for males, 96.3 for females, the *Yahgan* are orthocranic. The auricular height-length index, 62.1 for males, 63.3 for females, is between the limits of ortho- and hypsicrany. The fronto-parietal index, 67.4 for males, 67.5 for females, is metriometopic.

The angle of frontal inclination in the skulls is 49° in males, 50° in females, and the forehead is very retreating. The lateral frontal protuberances are hardly noticeable, but frequently there is a frontal torus.

Parietal eminences are present only in a very few cases, but a sagittal crest (lophocephaly) is frequently observed.

The occipital bone is flat in its cerebral portion, which forms almost a right angle with its cerebellar portion (Hyades and Deniker). There is often an occipital torus.

The morphological height of the face is 121 mm. for males, 111 mm. for females. The bizygomatic width is 142 mm. for males, 131 mm. for females. The facial index is 84.7 and 83.9, respectively, indicating euryprosopy. The superior facial index is 51.7 and 50.8, respectively, showing meseny.

The angle of total profile is mesognathic, being 82° in males, 80° in females. The orbits of the *Yahgan* are mesoconchic, the index being 79.5 for males, 80.2 for females. The nose is mesorrhinic, the index being 47.9 in males, 47.3 in females. The palate is leptostaphylinic, with an index of 74.8 for males, 71.7 for females. A palatal torus is always present, though sometimes weakly developed.

The mandible is large and massive. The bicondylar width, 123 mm. in males, 116 mm. in females, is somewhat less than that of the *Ona*.

Yahgan dentition is similar to that of the *Ona*. Hyades and Deniker noted that the permanent teeth appear earlier than in Whites.

Osteometric observations on the other bones of the skeleton are contained in Garson (1885), G. Sergi (1887, 1888), Hyades and

Deniker (1891), Hultkrantz (1907), S. Sergi (1928), Delle Seta (1938), Genna (1928, 1930–32), Jazzeta (1928), Pastore (1935–37), Scolni de Kliman (1938), and Sabatini (1933–34).

THE ALACALUF (HALAKWULUP)

The *Alacaluf* inhabit the islands, beaches, and channels from the Gulf of Penas south to the northwestern portions of Isla Grande in Tierra del Fuego. They number less than 90 persons (Gusinde, 1939).

SOMATOLOGY

Somatological studies and observations are contained in Bischoff (1882 a, 1882 b), Boehr (1881), Essendorfer (1880), Fitz-Roy (1839), Gusinde (1939), King (1839), Hyades and Deniker (1891), Lehmann-Nitsche (1916 d), Martin (1893–94), Manouvrier (1881), Outes (1909), Seitz (1833), Skottsberg (1910), and Virchow (1881).

The *Alacaluf* stature is small, the mean values according to five authors varying between 151.0 cm. and 161.4 cm. for men and between 143.2 and 152.2 for women. Gusinde, who as usual made the greatest number of observations (15 men, 16 women), gives an average of 154.7 cm. for men and 143.2 cm. for women.

The greatest head length has a mean of 192 mm. for men, 183 mm. for women, and the greatest head width is 148 and 143, respectively. The horizontal cephalic index has a mean of 77.4 for men, 78.2 for women, which makes the *Alacaluf* mesocephalic (Gusinde).

The face is oval or round, and, especially in women, it is flat. (See plate 27, *top*, *right*, and *center*.) The cheek bones are not very prominent. The average morphological height of the face is 120 mm. in men, 108 mm. in women. The bizygomatic width is 140 and 131 mm., respectively. The face is mesoprosopic in men (average index, 85.6) and euryprosopic in women (average index, 82.3) (Gusinde).

The nose is triangular as seen from the front; and either straight or somewhat concave from the side, though sometimes slightly convex. The nose is mesorrhinic, but close to the limit of leptorrhiny, the average index being 72.2 for men, 70.6 for women (Gusinde).

The forehead is low because the hair grows down toward the supraorbital ridges. The eye opening is generally fusiform. In almost all persons of this group there is a transverse fold on the upper eyelid (plica palpebralis media). A true Mongolian fold is not found among the *Alacaluf.*

The color of the eye is dark brown, corresponding to No. 2 on R. Martin's color scale.

The mouth is large, and the lips generally thick. A slight protrusion of the upper lip is frequently noted. The naso-labial furrow is well marked. The chin is rounded.

The body or trunk is 467 mm. long in men, 459 mm. in women. The biacromial width has an average of 387 mm. in men, 349 mm. in women (Gusinde). The thorax is generally almost flat.

The arms are well developed, the mean total length being 688 mm. in men, 622 mm. in women (Gusinde).

The legs are less developed than the arms, and the calves are thin. The authors constantly mention the poorly developed musculature of the legs, and they explain it in the same way as among the *Yahgan*, that is, the *Alacaluf's* habit of spending a great deal of time in their canoes, paddling or fishing. The mean total length of the leg is 814 mm., or 53.0 percent of the stature in men, and 730 mm., or 51.2 percent of the stature in women (Gusinde). The feet are large.

The *Alacaluf* skin color is light brown, corresponding to Nos. 13 to 15 on Von Luschan's color scale (Outes, 1909). The fatty tissue is well developed. Bischoff (1882 a, 1882 b) gives data on the microscopic structure of the skin. For fingerprints, see Abel (1934).

The hair is abundant and grows low on the forehead. Frequently it grows in on the temples, sometimes being continuous with the eyebrows. The hairs are thick, stiff, and smooth. For the microscopic structure of the hairs, see Martin (1893–94) and Saller (1939). The hair color corresponds to Nos. 27 and 4–27 of Fischer's table.

The beard is little developed, and in the armpits and the pubic region the hair is scarce.

CRANIOLOGY AND OSTEOLOGY

For the craniology of the *Alacaluf*, see Medina (1882), Martin (1893–94), Mehnert (1893), Garson (1885), Ten Kate (1904), Latcham (1911), and Gusinde (1939). Hoyos (1913) describes a Fuegian skull, but does not give its tribe.

The mean cranial capacity of the *Alacaluf* is 1,530 cc. in males, 1,295 cc. in females (Gusinde). Unfortunately, these mean values were determined on the basis of only 13 skulls.

According to Gusinde, the greatest skull length (see pl. 26, *bottom*) is 191 mm. in males, 180 mm. in females; the greatest width, 141 mm. and 138 mm., respectively. The mean horizontal cranial index is 74.6 for males, 76.7 for females, that is, dolichocranic for males, mesocranic for females. The basio-bregmatic height has a mean of 140 mm. for males, 130 mm. for females; the auricular height, 121 mm. for males, 117 mm. for females. The mean vertico-longitudinal index is 73.2 for males, 71.9 for females, showing orthocrany (Gusinde).

To judge by Gusinde's data, the mean indices of the *Alacaluf* may be classified as follows: Metrio- to tapeinocranic, according to the vertico-transverse index (97.6 for males, 91.5 for females); hypsicranic, according to the auricular height-length index (63.6 for males, 64.7

for females); metrio– to stenometopic, according to the fronto-parietal index (67.9 for males, 65.5 for females).

The medium angle of inclination of the forehead is, for both sexes, 52°. The forehead is low and sloping. The lateral frontal protuberances are little developed. The glabella is only slightly rounded; usually it corresponds to No. 2 on Broca's scheme (Martin). The *Alacaluf* skulls frequently have strongly developed superciliary ridges and a frontal torus. Parietal eminences are little developed and appear only in isolated cases. Lophocephaly is very frequent.

The occipital bone often has a torus, and the muscular relief is always well marked.

The mean morphological height of the face is 125 mm. in males, 113 mm. in females; the bizygomatic width is 143 mm. and 131 mm. respectively. The facial index, 86.5 for men, 85.9 for women, indicates mesoprosopy. The mean superior facial index, 51.1 for males, 52.0 for females, indicates meseny (Gusinde).

The angle of the total profile for both sexes has a mean of 84°, corresponding to mesognathy (Gusinde).

According to the mean orbital index (83.3 for males, 87.1 for females), masculine skulls are mesoconchic, feminine are hipsiconchic. The mean nasal index (46.2 for males, 48.6 for females) shows that males are leptorrhinic, females mesorrhinic. According to the mean palatal index (78.2 for males, 80.9 for females), males are leptostaphylinic, females mesostaphylinic. The upper dental arch usually has the form of a "U". A palatal torus is general and is characteristic in these skulls.

The mandible is very massive, the bicondylar width being 125 mm. in males, 117 mm. in females.

The teeth show considerable wear, especially in older persons. Caries occurred only rarely among the *Alacaluf* while they still retained their native culture. Today it is more frequent, owing to the influence of modern civilization.

The weight of the *Alacaluf* skull is considerable, as among all the Fuegians, owing to the thickness of the walls of the cranial vault.

For the remainder of the *Alacaluf* skeleton, see Martin (1892). Unfortunately a work by Vallois (1932) on the Fuegian humerus is not available to me.

NATIVES OF THE SOUTHERN PROVINCES

In the southern provinces of Chile, from Arauco to Llanquihue, live a considerable number of *Araucanians* or *Mapuche*, who are quite distinct from the foregoing tribes. This ethnic group is not homogeneous physically, as we shall see.

The *Araucanians* were estimated by Latcham (1928) to number 120,000 and were increasing rapidly. Brand (1941 a) places their total at 300,000, which is probably somewhat high. The distribution of the *Mapuche*, according to the 1920 census, is as follows:

Province of Arauco	4, 980
Province of Bío-Bío	1, 372
Province of Malleco	11, 815
Province of Cautín	58, 305
Province of Valdivia	19, 723
Province of Llanquihue	8, 697

The older chroniclers, including de Olivares, Gómez de Vidaurre, and Molina, as well as the historians, Barros Araña and others, referred to the physical appearance of the *Mapuche*. Special works on the physical anthropology of the *Mapuche* are, however, still very scarce.

SOMATOLOGY

The stature of the *Mapuche*, as the following mean figures show (table 1), has considerable variation according to locality.

Table 1.—*Data on the stature of the* Mapuche (*mean values*)

Locality	Males		Females		Source
	Stature (cm.)	Number studied	Stature (cm.)	Number studied	
Cordillera	168.4	18			Latcham (1911).
Sub-Andean region	164.3	11	147.5	6	Latcham (1911).
Central Valley	160.6	31	143.2	19	Latcham (1911).
Central Valley	162.2	41	143.7	11	Guevara (1898).
Central Valley	159.2	100			Matus (1912).
Coast	168.0	(?)			Latcham (1911).

According to these data, stature increases to a maximum in the regions of the cordillera, the habitat of the *Pehuenche*, and decreases toward the south, between the Toltén and the Gulf of Reloncaví, where the *Huilliche* live (Guevara, 1898). Schäuble (1939) noted that the inhabitants of the Coast are shorter than those of the Central Valley. On the other hand, Latcham (1911) considered that a Coastal subtype is taller.

The head is generally large, its mean maximum length reaching 180.8 mm. in men (Matus), and its mean maximum width 150.9 mm. The mean horizontal cephalic index in men is, according to Matus' data, 83.2, indicating brachycephaly. Matus (1912) found the following distribution of head form among 100 *Mapuche:* Dolichocephaly, 4 percent; mesocephaly, 14 percent; brachycephaly, 62 percent; hyperbrachycephaly, 20 percent.

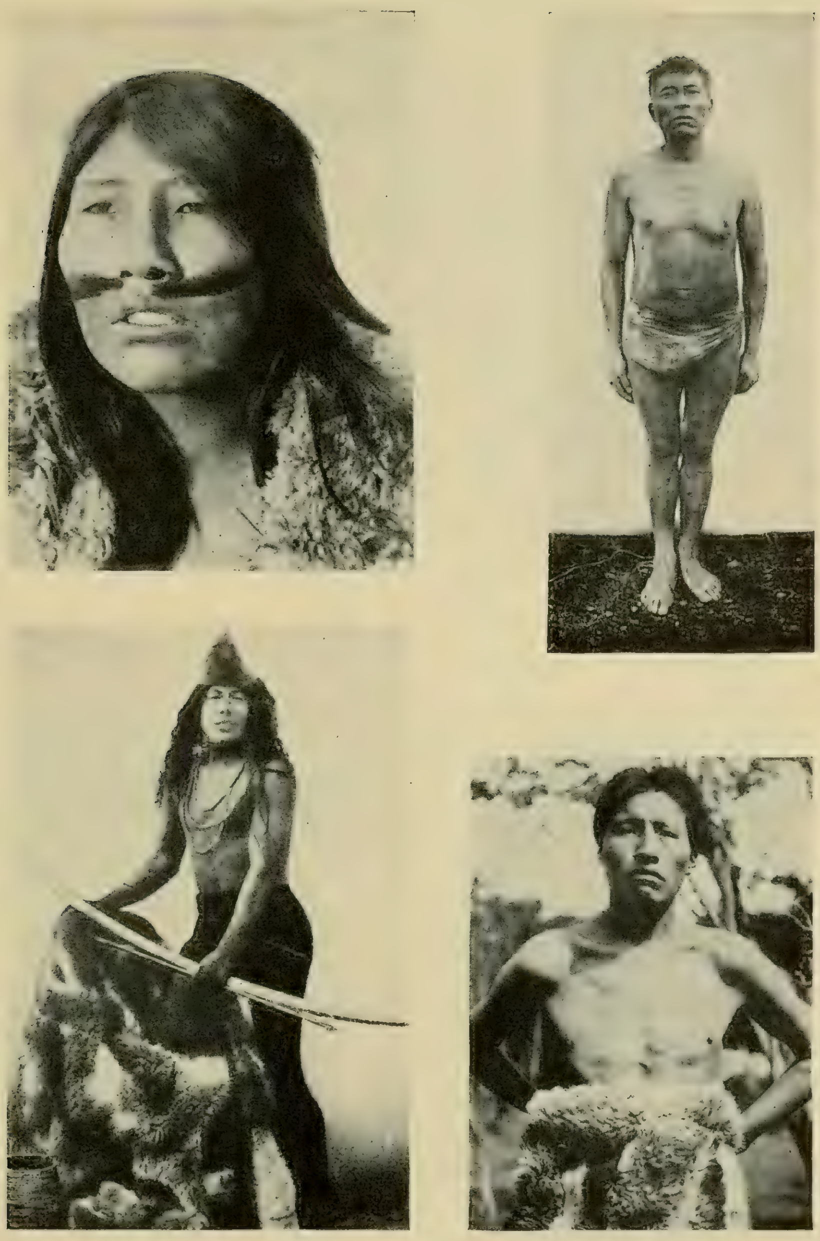

PLATE 24.—Physical types of Tierra del Fuego. *Top, left, Ona* woman; *top, right, Yahgan* type; *bottom, left* and *right, Ona.* (*Bottom, left,* after Pericot, 1936, p. 681; others, after Gusinde, 1939, pls. 1, 2, 3.)

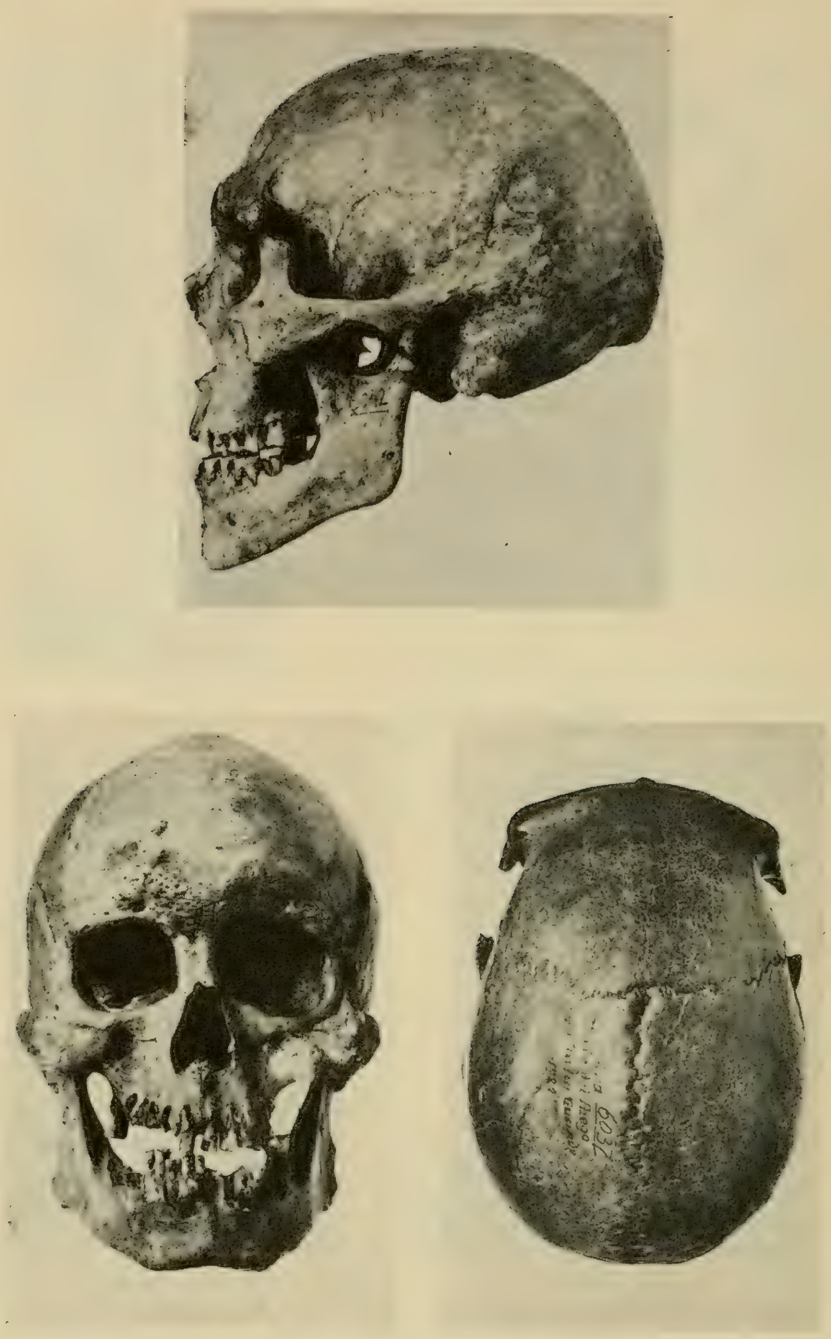

PLATE 25.—*Ona* skulls, Tierra del Fuego. (After Gusinde, 1939, pls. 7, 8.)

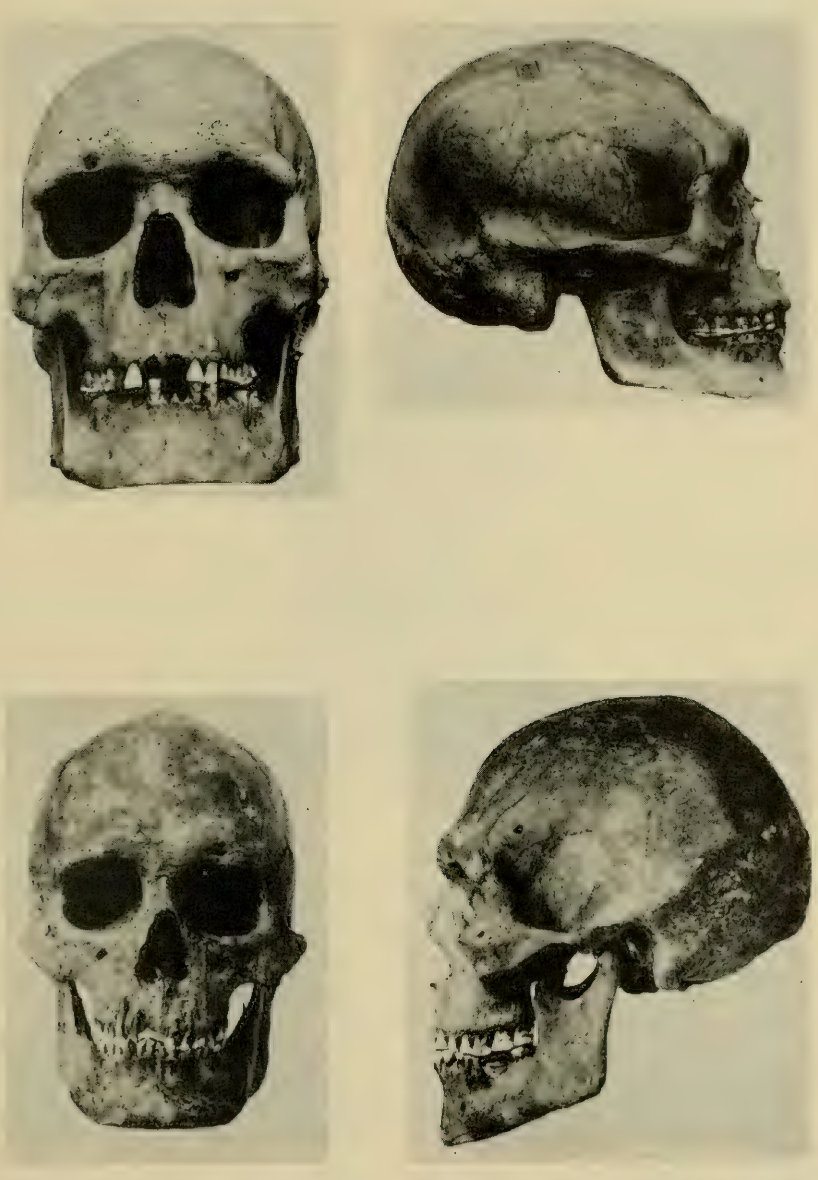

Plate 26.—Skulls from southern Chile. *Top, Yahgan; bottom, Alacaluf.* (After Gusinde, 1939, pls. 14, 13.)

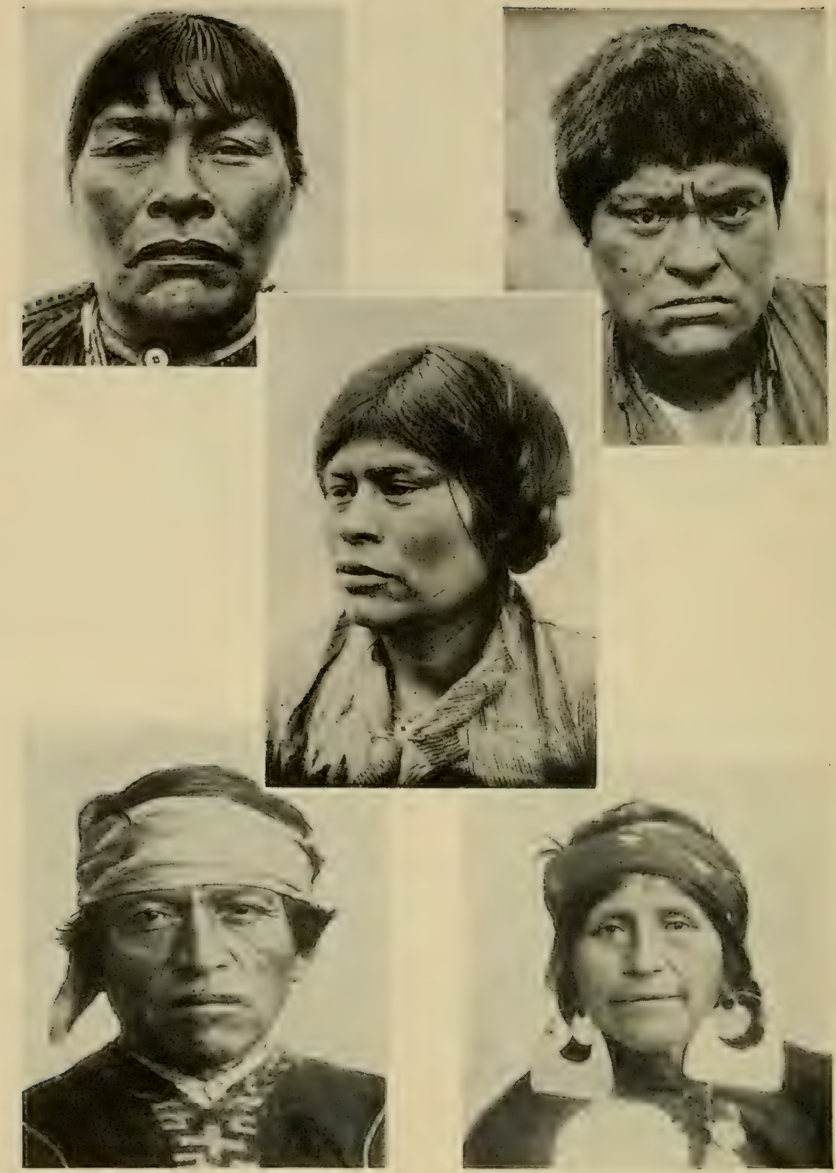

PLATE 27.—Physical types from southern Chile. *Top, left, Yahgan* woman. *Top, right, Alacaluf* type. *Center, Alacaluf* woman. *Bottom, left, Mapuche* chief. *Bottom, right, Mapuche* woman. (After Gusinde, 1939, pls. 4, 5, 6; bottom pictures courtesy Carlos Henckel.)

The face (pl. 27, *bottom*, *left* and *right*) is generally round, though in some it is angular. Seen in profile, the face is notably flat. Attention is called to the prominent and well-developed cheek bones. The forehead is narrow and low. The eye opening is narrow; frequently there is a transverse fold of the upper lid (plica palpebralis media) and a marginal fold. The iris is dark in color, most commonly corresponding to the shades Nos. 13, 14, and 15 of Martin's and Schultz' chromatic chart. The conjunctiva is somewhat yellowish. For histological details of the eye, see Henckel (1942 a).

The nose is generally broad; in profile, it is straight, never aquiline. The mouth is large, the lips generally thick. There is marked prognathism. The chin is square and somewhat prominent.

The neck is short and thick. The thorax is well developed, its mean lateral diameter in men being 31.8 cm. (Matus), and its antero-posterior diameter 22.0 cm. The circumference of the chest has a mean value of 93.0 cm., which is very high if we take into account the short stature of this group (Matus). The lung capacity of the men varies between 4,500 and 5,300 cc.

The back is broad in both sexes, and the abdomen is somewhat enlarged, showing a certain propensity to obesity.

The arms are short and thick, and the hands are relatively broad and short. The dynamometric hand pressure has been determined in some men by Matus; it averages 49 in the right hand and 47 in the left.

The legs are short and, especially in women, the thigh is thick and rounded. The ankle is thick; the calf has not been described. The feet are short and thick.

The *Mapuche* skin color has been characterized by the abbot Molina (1776), in the following words: "Although they are the lightest of all American natives of the south, their complexion is somewhat olive-color." Many individuals have skins no darker than those of southern Europeans. Microscopic observations on the quantity and distribution of cutaneous pigment have been made by Henckel (1941).

The Mongoloid spot is found very frequently in the newborn and nursing children; according to Mardones (1937), in 86.7 percent of the cases.

The arrangement of the dermal ridges on the hand was studied by the present author (Henckel, 1933 b, 1942 b). In 246 *Mapuche*, the Galtonian types occur with the following frequency: Arches, 7 percent; loops, 56 percent; and whorls, 37 percent.

The hair color is dark, usually corresponding to the shades V, W, and X on the chromatic table of Fischer and Saller. The head hair is very coarse: 94.3 μ average in women, 87.1 μ in men. It is also smooth and stiff. For its histological characteristics, see Henckel (1941).

We must mention certain blond *Mapuche*, with white skin and light eyes, in Boroa, Cautín Province, mentioned by the old chroniclers, Gómez de Vidaurre and Molina. Guevara and Latcham (1911) regarded them as the result of accidental crosses of Indians and Whites. It is more likely, however, that this was a case of partial albinism, as has been observed in other native American groups.

The head hair of the *Mapuche* is very abundant. It grows low on the forehead and temples. Kretschmer's "fur cap" is quite common (Barrientos, 1942). Sometimes, especially in children, the head hair continues to meet the eyebrows (Schäuble, 1939). In rare cases, there is baldness. Gray hair comes late in life (Poeppig, 1942).

There is little beard, and body hair is scarce. There are few hairs in the armpits and pubic region, even in individuals well developed sexually (Pi-Suñer and Reyes, 1935).

Barrientos (1942) has diagnosed Kretschmer's constitutional types among the *Mapuche* as follows: "Pyknic," 46.8 percent; athletic, 18.9 percent; and leptosomic, 34.0 percent.

For some other aspects of *Mapuche* somatology, see Houzé (1884), Latcham (1904), and Manouvrier (1883).

CRANIOLOGY

The present status of *Mapuche* craniology has been well characterized by Brand (1941 a):

> . . . a few small series of Araucanian skeletal material are present in Chile, Argentina, France, Germany, Great Britain, Spain, Scandinavia, Italy, and the United States. However, no museum has an adequate collection and not even one anthropometric index, ratio, or simple measurement has been made on an adequate number of specimens. [Brand 1941 a, p. 33.]

Thus, unfortunately, we can give but few data on *Mapuche* craniology. Medina (1882) gives some figures and measurements on seven *Araucanian* skulls, but without the main details.

The horizontal cranial indices of 18 male and female *Mapuche* from the Central Valley range from 72.2 to 84.4 and have a mean of 80.3 (Guevara, 1898, 1912). These include 3 which are dolichocranic, 3 mesocranic, and 12 brachycranic. In a series of 12 male and female crania from the cordillera, to the east, the same index varies from 70.5 to 85.0, and includes 6 which are dolichocranic, 3 mesocranic, and 3 brachycranic. Guevara concludes that brachycrany predominated on the Coast and in the northern part of the Central Valley and that dolichocrany was increasingly present in the south and in the cordillera, to the east.

As descriptive craniological characteristics, Guevara mentions the weight, roughness, narrowness of the forehead, the flatness of the posterior curvature, the prominence of the inion, the well-marked superciliary ridges, the great development of the malar bone, and the width of the lower jaw.

Vergara Flores (1902) made a comparative study of the crania of the *Araucanians* and *Aymara.*

Verneau (1903) examined 6 *Mapuche* skulls (one male, five female), which came from Mochita graves in Concepción and are now in the Museum of Natural History in Paris. Their mean horizontal cranial index is 81.5 and 81.4, respectively, indicating brachycrany. Their mean vertico-horizontal index is 79.1 and 77.3, respectively, indicating hypsicrany. Their mean vertico-transverse index is 92.0 and 94.9, respectively, indicating metriocrany. The average facial index for the female skulls is 70.7 (hypereuryprosopy). The mean orbital index is 87.2 and 89.4, respectively, which, according to Broca, is mesoconchic. The mean nasal index is 56.1 and 54.6, respectively, indicating chamaerrhiny.

The average cranial capacity of the *Araucanians* is 1,425 cc. for 6 male skulls and 1,355 cc. for two female skulls, according to Quatrefages and Hamy (cited by Verneau, 1903).

Latcham (1911) gives 81.7 as the mean cranial index of 92 male and female *Mapuche* skulls from the Central Valley. The average cranial capacity for the male skulls is 1,350 cc. and for the female skulls, 1,230 cc. This, in Sarasin's sense, is euencephaly. The mean height index is 86.6, the *Mapuche* thus being high-headed ("hypsiacrocephalic").

The facial skeleton, according to Latcham (1911), has the following characteristics: Bizygomatic diameter, 136 mm. in males, 132 mm. in females; orbital index, 85.2; nasal index, 48.5 (mesorrhinic); subnasal profile angle, 76.2° (prognathic).

Deniker (cited by Martin, 1928) gives the average *Araucanian* cephalic index as 83.9 for males and females.

Araucanian dentition has been studied morphologically by Muñoz (1936), who gives information on wear, caries, malocclusion, trema, diastema, Carabelli's tubercle, etc.

Although they have not been utilized in the present article, mention should be made of the work done by Ten Kate (1892) among the Argentine *Araucanians* and the studies made by Puccioni (1912) and Hoyos (1913).

THE INDIANS OF NORTH CHILE

North of the Río Loa to the Chilean-Bolivian border are various *Aymara* Indians whose number Brand estimates (1941 c) at 40,000.

The ancient *Atacameño* of the Cordillera de Antofagasta and Tarapacá and the Puna de Atacama (Latcham, 1911; Oliver, 1932) have disappeared completely, despite the claim to the contrary by Brand, who confuses them with the present Indians living in the Puna de Atacama. For the last, see Philippi (1860).

The Chilean *Diaguita*, who lived in the southern part of the Province of Atacama and the Province of Coquimbo, have disappeared as an ethnic group, but their physical type has been preserved in the rural population of this region (Brand, 1941 b).

In the littoral north of the Río Loa lived the *Uro*, who are completely extinct today. According to Latcham (1912), they were brachycephalic.

The coast between the Río Loa and the Río Choapa was occupied by the *Chango*, of whom a few descendants survive in the coves between Tocopilla and Taltal, where they are civilized and mixed with Whites (Oyarzún, 1927 b; Oliver, 1932; Brand, 1941 c; see also Handbook, vol. 2, pp. 595–597). Some of their somatological characteristics have been described by D'Orbigny (1839), Philippi (1860), Latcham (1910, 1911, 1926), and Gigoux (1927). Latcham (1911) gives the following description:

> The Changos were of low stature, 160 cm. for men, 145 cm. for women. The body is large in proportion to the arms and legs; the shoulders wide. But the chest is not so well developed as among the mountain people.
>
> The face is wide and the features are rugged. The forehead is not very narrow but it is low and receding. The eyes are small and dark, the nose is narrow at the base but broad at the end, and always straight, never aquiline. The mouth is large, the lips thick and everted.
>
> The skin is dark, being brown as burned by the sun and wind and not reddish. The hair is black, stiff, straight, and lusterless, and it grows so low over the temples that the forehead appears narrower than it really is.
>
> The mien is somber and sad. [Latcham, 1911.]

For the craniology of the *Chango*, there are works by Latcham (1903, 1904 c, 1912, 1939), Vergara Flores (1905), Fonk (1906, (1912)), Barras de Aragón (1909), and Ibar (1933).

Morphological characteristics which have received a great deal of attention are the thickness of the walls of the skull (an average of 11.65 mm.), especially in the occipital and malar regions ("skulls with thick walls," says Vergara), and the great weight. According to Latcham (1912), the *Chango* skulls are long, "dolicho- or subdolichocephalic," with a tendency to lophocephaly. The greatest width is between the parietal protuberances. The forehead is narrow but not depressed. The face is long, narrow, and somewhat flat. The orbits are rectangular. The palate is very wide, and prognathism is pronounced.

For a series of 19 *Chango* skulls from the Río Loa, Vergara (1905) gives the following mean values: Cranial index of males, 80.2, of females, 88.4; orbital index for males, 87.4, of females, 91; nasal index of males, 50.6, of females, 52.6.

The average cranial capacity of 9 *Chango* skulls from Paquica is 1,302 cc. (Ibar, 1933). Ibar gives the average cranial index as 74.9, the orbital index as 87.7, and the nasal index as 48.4.

According to Ibar, the long bones of the *Chango* are notable for their thickness and evidence of strong musculature, especially of the arms.

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THE GEOGRAPHICAL PATHOLOGY OF CHILE

By Ernesto Herzog

One of the principal tasks of geographical pathology is to study in each country the diseases that are related to climate, to conditions of life, to racial and other factors, and to investigate the differences of their course and form as compared with those known in other countries. From this can be deduced the enormous importance of the comparative study of diseases in different parts of the world, a fact which can furnish many leads to the etiology, mode of course, and manifestation of many pathological patterns, which up to the present are not clear or are unknown.

These conditions can be more easily studied in countries which are sparsely populated but have a great climatic variety due to their great extent of territory. In this sense, Chile is undoubtedly one of the most interesting from the point of view of its geographical pathology because of its great territorial expanse from lat. 18° to 56° S. In the northern part of the country there are tropical but very dry regions, besides desert zones, and great differences in altitude from a few meters above sea level up to 3,000 to 4,000 m. (about 9,000 to 13,000 ft.); in most of the southern part, in the wilderness and lakes, a humid climate prevails, and in the region of Magallanes, in the far south, there is less humidity but more winds, and the weather is cold. Further differences exist between the maritime zones on the littoral of the long coast, the continental zones of the central part, and the cordillera region. Unfortunately, the low density of the population and in some places its entire lack is as yet an obstacle to the extension of geographical pathological studies through the whole country. Accurate data can be obtained only on the basis of a great number of autopsies which up to the present time have been possible only in the large cities where there are institutes of pathological anatomy. The confidential observations made by some doctors in places where no anatomico-pathological services exist may also be of importance. Due to these difficulties, however, it has been impossible to obtain exact anatomical details about the constitutional and pathological anatomy of the natives of Tierra del Fuego and about the *Mapuche* (*Araucanian*) Indians scattered through the southern part of the country. With the establishment of new anatomico-pathological institutes in the future, we may be able to add further contributions to this subject.

The racial components of the population of Chile are mainly the White race, particularly from Spaniards and other Europeans, and the native Indian. The Negro is virtually nonexistent in Chile. Thus, we deal in Chile mostly with a population of mixed White and native stocks.

It is of the utmost interest to ascertain whether this mixture produces special reactions to disease as well as characteristic morphological types, and whether it has greater or lesser resistance with regard to definite pathological patterns. As yet anatomical investigations based on autopsies are insufficient to permit accurate general deductions. The determination of exact racial and constitutional factors is also complicated by a series of other factors, such as climatic or environmental ones, which cannot always be well defined or singled out. And so, our studies on geographical pathology refer to some thousands of autopsies in the course of 12 years in the central zone of Chile, practiced for the most part at the Universidad de Concepción and partly in the corresponding Institutes of Santiago and of Valparaíso, besides medical observations, without autopic control, in the different parts of the country. Hence, this is but a modest trial and only a beginning for the geographical pathology of Chile.

First, we must direct our attention to certain infectious and parasitic endemic diseases.

Typhoid fever.—This is an endemic disease throughout the country and is conditioned, in the first place, by certain hygienic deficiencies, for example, lack of potable water in many small towns and especially in rural zones. Also the old system of irrigating vegetable gardens and flower gardens by means of trenches, i. e., open canals full of dirty water that runs through entire communities, have contributed a great deal to the spreading of the typhoid bacillus, thus causing infection of human beings directly as well as through contaminated fruits. Of course, this danger has diminished in the last few years in cities with good systems of potable water, but there are still other sources of infection by unkempt humans, purveyors of germs, and contaminated food. Observations, verified also by autopsies, show that foreigners living in Chile are much less resistant to typhoid fever than the autochthonous Chileans; also the death-rate among foreigners is much higher. Although the course and anatomical pattern of this disease does not show any major deviation from that observed in other countries, it is notable that mild cases are more frequent here than in Europe. The explanation of this phenomenon seems to be that people living in more primitive or at least less hygienic conditions and who, therefore, are always apt to have more contact with the typhoid bacillus should be in a state of relative immunization, a fact that results in milder patterns than in the case of persons who have not been subjected to infection, i. e., who have not become allergic to them. Unfortunately, we have no available data of this disease among the natives so that we cannot substantiate this thesis. We do not think it probable that there is any racial influence in these cases, although this possibility cannot be entirely disregarded until it has been studied.

Exanthematic typhus.—This infectious disease is also endemic in Chile, for isolated cases are always found, and its appearance depends primarily upon hygienic and social factors. Epidemics which appear now and then, such as that of 1932 to 1935 with a 20 percent mortality, are caused by unknown biological factors besides the hygienic and social ones (Herzog, E., 1937, pp. 574–600). We do not know as yet the extent of this disease among the natives, but epidemics among them have not been mentioned. There do not seem to be great differences in the appearance of exanthematic typhus in the various regions of the country, although during the last epidemics the northern and central zones were the more affected while no cases occurred in Magallanes. As yet, however, it is impossible to determine definite climatic influences.

Epidemic meningitis.—Meningococcic meningitis appears, from time to time, in the form of limited endemias, especially in the northern and central zones of the country, but it presents no particular characteristics differing from those known in other countries. In 1942, during a certain period, the cases of meningitis were more frequent and almost assumed an epidemic character.

Tuberculosis.—The problem of tuberculosis in Chile is one of the gravest, for Chile ranks second among all the countries of the world in the frequency of tuberculosis and the mortality due to it (Holtheuer, 1934–35). Until now, the patterns obtained from autopsies show practically the same anatomical and clinical aspect observed in other countries, but whether tubercular preinfection in adults is not more frequent than had been thought is a matter of discussion. Observations made at autopsies both in Concepción and Santiago suggest prime infection in adults, particularly among adolescents, but the total number is not as yet sufficient to draw any general conclusions. The characteristic trait in these cases is an extensive and intense caseous lymphadenitis of the hilus nodes and tracheo-bronchial ganglia, with progredient tuberculosis of the lungs, well-known forms in the precocious generalization of primitive tuberculosis in children. Should this fact be further verified, it would point to an environment as yet not wholly tuberculized. It would be also interesting to make a comparative study of the course of this disease among the natives, something that has not yet been done. As to the different parts of the country, there do not seem to exist any major differences in the tuberculosis pattern, although we still lack anatomico-pathological data about the extreme north and southern regions of the country to decide definitely on any possible climatic influences.

Syphilis.—Anatomical manifestations of syphilis observed at present in Chile are few, which agrees with the observations of the last decades in many countries. Thus syphilitic gummas on the autopsy table are rare, and so are serious destructive osseous alterations. The only evidence rather frequently noted in adults is luetic mesaortitis with or without aortic aneurisms. The pattern of luetic mesaortitis has been observed in the Instituto de Anatomía Patológica in the Universidad de Concepción, with 2.9 percent out of 1,152 autopsies and 1 percent of aortic aneurisms (Jara, 1936). This figure is more or less stable. The reason for a lesser frequency of organic syphilis in adults must be sought, first of all, in effective treatment. There are also biological factors which are not known in detail. There are no further data as to syphilis among the natives.

Congenital syphilis plays an important role in the death rate of children. Anatomical statistics made at our Institute, based on autopsies with thorough histological examinations, have revealed 37.4 percent of congenital syphilis among 143 premature and newly born infants (Rojas, 1936). Undoubtedly, the role of congenital syphilis as a decisive factor upon infant mortality has been greatly exaggerated. It is known from numerous observations and especially autopsies that there is a series of other factors that account for such high mortality among children in Chile, such as malnutrition, lack of hygiene, and social conditions.

Actinomycosis.—This infectious disease, caused by the actinomyces, is rarely apparent either in the autopsies or in the central wheat zone, but, unfortunately, there are no exact statistics to compare its frequency with that of other countries. Thus far this is only our impression based on autopsic data.

Malignant pustula (anthrax).—As Chile is an extensive agricultural country it should not cause surprise that autopsies show a certain percentage of deaths due to the anthrax bacilli with the same manifestations observed in other countries.

Other infectious septical patterns.—Patterns of puerperal sepsis, angina, polyarticular rheumatism, endocarditis (Torres, 1937) and others are very frequent and they have shown no major variations in their course and general pattern. It is a very remarkable biological phenomenon that in a relatively high number of serious cases of abdominal wounds, some even with the intestines protruding, no consequent peritonitis occurred. This phenomenon is somewhat familiar to surgeons but such cases appear also among our data and in forensic medicine. The remarkable fact is that it generally occurs among the lower classes who, despite living under deplorable hygiene and in a filthy environment, do not develop purulent infections. There are even cases in which the patient came to the doctor hours after being wounded, with the intestines out of the body and wrapped in ordinary paper, yet without consequent peritonitis. There are no exact statistics and it is very difficult to determine whether this phenomenon is due to individual resistance or to other factors. With regard to postoperative pneumonias, their lesser frequency stands in marked contrast with that of many countries where it is rather serious and is rightly feared.

Rabies.—Rabies is relatively frequent throughout almost all the Chilean territory owing largely to the great number of errant dogs which transmit the disease, mostly to other animals but also to human beings. Among human beings it is infrequent, thanks to good anti-rabies service by vaccination. According to our observations, there is well-founded suspicion that on certain occasions mice appear as the spreaders of the virus, a fact that has yet to be verified by further research. The course of the disease does not vary from what is already known.

Parasitic diseases: *Malaria.*—This disease appears in Chile only in the northern tropical zone of Arica and its environs, in the pattern already known. Already it has been notably reduced by the effective struggle against this scourge.

Chagas' disease.—Of late years isolated cases of this disease have been observed, first, in the Province of La Serena, or northern part of the country, but the vinchucas transmitters (*Triatomas infestans*) have also been observed in the Province of Santiago. Farther south this disease is unknown and should not be expected on account of certain determining climatic conditions. Further data are lacking as these observations are comparatively new. No fatal cases have been described yet.

Amebiasis (amebic dysentery).—This disease, of frequent occurrence in Chile, is not exclusively limited to the northern or tropical zones of the country, but is also observed rather frequently in the central zones and even in the south. No exact information could be obtained for the region of Magallanes. The anatomically typical pattern appears with the more or less extensive ulcerations of the large intestine and, in many cases, with the serious complication of the hepatic abscess. The frequency of amebiasis should be determined primarily by hygienic factors similar to those mentioned in connection with abdominal typhus fever.

Parasitic diseases caused by intestinal worms.—These are likewise important and frequent. First of all is the *Taenia echinococcus* transmitted to man by dogs, one of the most serious problems in the country due to the great number of dogs that live together with the common people under utterly inadequate hygienic conditions. Thus, it is not surprising to find rather frequently at autopsies hydatinous cysts, primarily in the liver, lungs, abdominal cavity, but likewise in other organs, even in the heart itself, and we have observed in our material an extensive intracranial hemorrhage which was fatal because of a scolex of echinococcus found in the wall of the anterior cerebral artery which caused its rupture (Behn, 1938, pp. 535–538). Among almost 2,000 autopsies at our Institute we find a frequency of echinococcus of about 1 percent although this figure should ordinarily be higher (Behn, loc. cit.). In the larger cities the frequency of echinococcus should have diminished during the last 10 years due to better general hygiene. *Taenia solium*, although less frequent, is also found in autopsies. Through human autoinfection owing to lack of hygiene and through infection caused by flies and infected lettuce, it leads to the pattern of cysticercosis with preferential localization of the *Cysticercus cellulosae* in the brain and other organs like the heart, liver, lungs, etc. The *Ancylostoma duodenale*, with its resulting anemia, etc., has been observed rather frequently in the coal mines of the central zone of the country, but it is notably diminishing through effective treatment.

We will not mention other parasites of the family of intestinal worms in order to avoid special pathological patterns.

Other pathological patterns.—Besides these groups of infectious parasitic diseases, numerous other pathological patterns have been studied, for example, those of arteriosclerosis, anemias, hepatic cirrhosis, ulcers of the stomach and duodenum, cholecystitis, and cholelithiasis, embolism, thrombosis, and cancers (Moena, 1933), etc. There already exist some clinical and anatomico-pathological statistical data about the cities of Santiago, Valparaíso, and Concepción, presented at the Congresos Internacionales de la Sociedad Internacional de Patología Geográfica, and in part, in the communications of our coworkers (see bibliography). We cannot mention all these patterns in detail since they are of interest only to specialists; however, in what follows we make a limited selection of noteworthy pathological patterns which show, in part, marked differences from what has been observed in other countries.

Hepatic cirrhosis occurs in Chile rather frequently, i. e., in 2.2 percent of cases among 3,000 autopsies made in the Institutos de Anatomía Patológica of Santiago, Valparaíso, and Concepción (data furnished to the 1st and 2d International Congress of Geographical Pathology held in Geneva in 1931 and in Utrecht in 1934). (See also Petersen, 1933.) Although the anatomical and clinical pattern does not differ from that in other countries, it is interesting that this disease is less frequent in this country than in others (Switzerland, for example, with 9–14 percent), despite the fact that Chile has a considerable production of wines and a great deal of alcoholism among the population. From this we can at least deduce that alcohol cannot be an exclusive factor in the genesis of hepatic cirrhosis, although one cannot as yet make any conclusive pronouncements on the exact etiology of this disease.

As to *thyroid goiter*, special studies made of its frequency in the autopsies and biopsies of our Instituto show that it reaches 1.8 percent in almost 2,500 cases (Suazo, 1933). The greatest part of the observed material comes from the province of Concepción near the sea, in the central part of Chile, and from some other neighboring provinces, and, therefore, is unilateral; yet it clearly shows the existence of colloidal goiter in its diffused or nodular form, although with slight increases in shape in the flat zone and in parts of the littoral. Unfortunately, insufficient evidence is available from other parts of the country, but statistics, which include the geographical distribution of goiter throughout Chile, are in preparation. We can only say that thyroid goiter has been observed in other parts of the country, but never in as great numbers as in such mountainous regions as Switzerland. Generally, the cordilleran valleys of Chile are sparsely populated; as yet cases of goiter in these regions have not been observed to be more frequent or more noticeable. *Endemic goiter* is known only in the region of Teno, Chile, and in the central plain in the southern part of Santiago in conjunction with cretinism. *Basedow goiter*, on the contrary, is noted everywhere with the same moderate frequency as in other countries and has no relation whatsoever to race or climate.

Of utmost interest has been the comparative study of *embolisms* and *thromboses* in Chile, all the more, since in many countries fatal pulmonary embolism is one of the most dreaded and most serious complications following surgical operations. An increase in this pattern has been verified in various countries in the last few years, a fact which, together with the somewhat obscure etiology, constitutes an enormous problem. It is noteworthy that statistics from all parts of the country show fatal pulmonary embolism to be exceedingly rare in comparison with other countries. We have found only 0.4 percent of violent embolisms among 3,900 autopsies from our material in Concepción, while in European countries and in the United States this percentage reaches 3 to 5 percent and more (Herzog, E., 1943). Likewise, venous thromboses are 2.4 percent of the same material, a figure lower than that of many other countries. These data agree with surgical clinical statistics furnished by doctors from all parts of the country. It is remarkable that in Chile, climatic factors seem to have no major importance. We are acquainted, besides, with reports of other doctors and pathologists from different South American countries who have made the same observations. This almost eliminates the racial factor, but we still consider it premature to reach general conclusions about the etiology of thrombosis and embolism.

It is worth mentioning that *amyloidosis*, in the form of deposits of amyloid, especially in the spleen, liver, kidneys, etc., and particularly in cases of extensive chronic suppurations, syphilis, etc., is very rare in Chile according to the tests of anatomico-pathologists. We do not possess exact figures but its frequency is far below that of European countries. So far its cause is unknown.

With regard to other diseases, specially cancer, there is no need to dwell on them. Observations respecting their development, form, and frequency seem very similar to those of most other countries.

To be fruitful, in the future, the geographical pathology of Chile must be broader, it must be based upon anatomico-pathological statistics, combined with medical statistics, from all parts of the country, and it must cover the natives and the zones where, up to the present, there are no anatomico-pathologists. Thus, our contribution is still very imperfect and modest, but as the first of its kind and based mostly upon autopsies, it should serve as a stimulus for future investigations in this field.

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THE PHYSICAL ANTHROPOLOGY OF THE INTERNAL ORGANS AMONG THE RACES OF CHILE

By Carlos Henckel

INTRODUCTION

Physical anthropology, i. e., the natural history of the Hominidae, has until now stressed somatological and osteological research but has seriously neglected the anthropology of the internal organs, so that very little is known of racial differences in myology, angiology, splanchnology, the nervous system, and the organs of sense.

During recent years, however, and especially since the publication of E. Loth's book (1931), anthropologists throughout the world have been devoting more time to the internal organs of the human body. Hence, it seems advisable to summarize the research that has been made on these organs in Chileans so as to indicate their present stage of development.

This account must dispense with any discussion of the native inhabitants of Chile (*Mapuche*, Fueguians, etc.) since studies of these groups are scarce and quite incomplete. The only research on the internal organs of the *Mapuche* was done by Westenhoeffer (1911), who performed autopsies on *Araucanian* corpses. In addition, there are the studies of Henckel on the integument (1941) and the eye (1942 a) and those of Mardones (1937) on the Mongolian spot in the *Mapuche*. Concerning the internal organs of the Fuegians, I shall mention only the work of Seitz (1883, 1886) and of R. Martin (1893–94).

DIGESTIVE APPARATUS

Tongue.—The chalice-shaped papillae (papillae circumvallatae) [1] of the tongue appear in a V, Y, T, or straight-line formation. According to Soenksen's observation (1936) of 217 indivdiuals, the V formation appeared in the large majority of cases (90.4 percent); Y, T, and straight-line formations appeared in the following percentages, respectively: 5.9 percent, 3.2 percent, and 0.5 percent.

The number of these papillae varies considerably; in the Chileans it fluctuates between 4 and 14. The average is 9.37.

The fimbriated fold (plica fimbriata) sometimes appears on the lower surface of the tongue. In half of the cases it is entirely lacking (49.8 percent); in 44.2 percent it appears in an elemental form, and is well formed in only 6 percent of cases.

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[1] The Latin terms have been taken from Jena Nomina Anatomica of 1935 (I. N. A.).

Palate.—Judging from Weldt's investigations (1934, 1935), the central raphe of the palate (raphe palati) consists, in the large majority of cases, of two parallel ridges in the mucous membrane of the palate.

The palatal tubercle (papilla incisiva) of the Chileans, as Weldt has shown, is generally oval or pear-shaped. It seems that there are considerable racial differences: for example, in the Japanese it is very often spindle-shaped.

The degree of development and number of palatal ridges (plicae palatinae transversae) are, as we know, quite variable. According to Weldt, in Chileans they number from 3 to 6, the average being 4.26 in the men and 4.05 in the women. They extend over a rather large surface of the palatal mucous membrane, sometimes reaching the level of M_1. They are in general well developed, with extensive branchings.

Data on the morphological characteristics of the Chilean uvula (uvula palatina) were produced by Figallo (1940) as the result of observations made on 1,000 individuals.

The position of the uvula is generally perpendicular (96.1 percent), variations having been found in only 3.9 percent of cases. In the large majority, the uvula has the shape of a cone (40.3 percent) or a cylinder (48.1 percent); round uvulas are relatively infrequent (1.9 percent), as are likewise filiform uvulas (0.1 percent), narrowed ones (0.4 percent), and undeveloped ones (2.4 percent). Bifid uvulas have been found in only 2.9 percent of cases; nevertheless, in scarcely 0.3 percent this anomaly was perfect in shape.

The intestine (intestinum).—From M. Tapia (1939), who ascertained the length of the small intestine, we have the statistics shown in table 1.

TABLE 1.—*Length of small intestine in Chileans (from Tapia, 1939)*

Sex	Number	Average (m.)	Minimum (m.)	Maximum (m.)
Men	115	7.344	5.51	10.70
Women	35	7.316	5.06	8.40

As regards the frequency of Meckel's diverticle (diverticulum ilei), the same author states that this appears in only 0.2 percent of cases. Mahn (1933) has seen it in 1.5 percent of 800 newborn babies.

The two authors mentioned give numerous details concerning variations of the intestine and its relation to the peritoneum; these should be read in the original.

The liver.—Henckel and Skewes (1943) give us the averages for weight of the liver shown in table 2.

TABLE 2.—*Weight of the liver in Chilean men (in grams) (from Henckel and Skewes, 1943)*

Age (years)	Absolute weight		Relative weight[1]	
	M[2]	m (M)	M	m (M)
20–30	1568.42	26.74	27.24	0.48
31–40	1467.89	57.17	27.42	.81
41–50	1612.00	49.09	28.08	1.12
51–60	1510.00	40.53	25.50	.94
61 and over	1310.00	91.92	25.30	1.67

[1] Relative weight is equal to the weight of the organ in grams per kilogram of body weight.
[2] M indicates the average or arithmetic mean; m (M) the mean error from the average.

Mahn (1933) studied the weight of this organ in newborn Chilean babies; he arrived at an average of 142 gm. for the boys and 146 gm. for the girls.

RESPIRATORY SYSTEM

The lungs.—Certain facts concerning the weight of the lungs in Chileans have been produced by N. Muñoz (1934) and Henckel and Skewes (1943).

N. Muñoz (1934), after having studied 90 lungs entirely free from disease, concluded that 960 gm. was the average absolute weight of both lungs; that of the right lung being 500 gm. and of the left 450 gm. However, the author does not mention the sex of the bodies on which he made his investigations.

Henckel and Skewes (1943) considered the weight of the lungs in 129 Chilean men, arriving at the conclusions shown in table 3.

TABLE 3.—*Weight of the lungs in Chilean men (in grams) (from Henckel and Skewes, 1943)*

Age (years)	Left lung		Right lung		Both lungs			
	Absolute weight		Absolute weight		Absolute weight		Relative weight	
	M	m (M)	M	m (M)	M	m (M)	M	m (M)
20–30	390.48	12.23	462.70	13.08	850.00	23.64	14.69	0.40
31–40	423.33	17.74	490.00	21.39	900.00	38.28	15.13	0.57
41–50	458.33	26.46	530.56	29.71	977.78	55.87	17.44	1.17
51–60	495.00	39.03	545.00	47.71	1025.00	84.69	17.20	1.61
60 and over	437.50	30.28	575.00	43.28	1006.25	68.11	20.00	2.35

N. Muñoz (1934) and Jirón (1935 b) made observations on the variations in peripheral segmentation of lungs in Chileans.

The horizontal fissure (fissure interlobularis horizontal) of the right lung is incomplete (fig. 3, *left*) in 58.82 percent of cases (N. Muñoz,

1934) while in only 41.17 percent of cases it reaches the anterior edge of the lung (M. Tapia, 1932).

According to Jirón (1935 b), a secondary fissure is seen rather frequently on the upper half of the lower lobe of the right lung.

The so-called azygous lobe, an additional lobe at the base of the right lung, is found completely developed (as proved by N. Muñoz, 1934) in 5.29 percent of cases and incompletely developed in 3.52 percent.

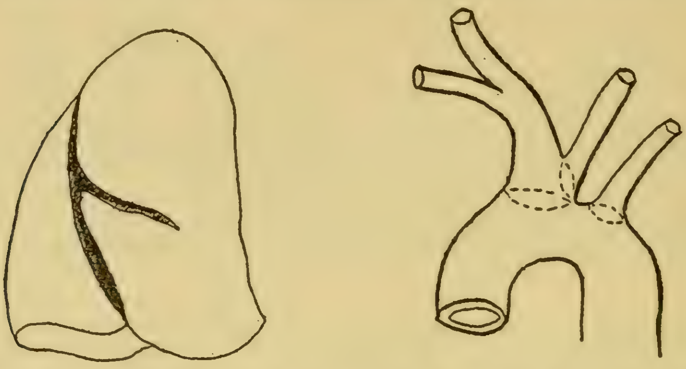

Figure 3.—Lung and aorta. *Left:* Incomplete horizontal fissure of right lung. *Right:* Origin of truncus brachiocephalicus and first left carotid artery from a common branch of the aorta.

CIRCULATORY SYSTEM

Heart.—Henckel and Skewes (1943) give the following information concerning the weight of the heart:

Table 4.—*Weight of the heart in Chilean males* (*in grams*) (*from Henckel and Skewes, 1943*)

Age (years)	Absolute weight		Relative weight	
	M	m (M)	M	m (M)
20–30	318.73	5.00	5.55	0.09
31–40	324.19	7.46	5.46	.11
41–50	338.27	13.30	5.70	.17
51–60	367.50	12.74	6.14	.19
61 and over	336.36	11.91	6.26	.32

Arch of aorta (arcus aortae).—According to N. Muñoz (1933), among the different types of aortic arch, one is particularly frequent in Chileans: the brachiocephalic trunk (truncus brachiocephalicus) and the first left carotid (arteria carotis communis sinistra) originate from a common branch of the arch of aorta (fig. 3, *right*). This formation has been verified in 25 percent of 300 female corpses.

In 8 percent of the same group it was observed that the left vertebral artery (arteria vertebralis sinistra) started from the arch of aorta. There are no percentages for other types of the aortic arch.

Concerning variations of the coeliac artery (arteria coeliaca), the gastric coronary artery (arteria gastrica sinistra) and the hepatic artery (arteria hepatic communis), I might mention the excellent data furnished by Flores (1939).

Spleen.—There are various works concerning the peculiarities of this organ in Chileans.

Recently the newborn's spleen was studied by Mahn (1933). Perhaps the most important conclusion reached by this author is that at birth the weight of this organ in Chileans (males, 11.2 gm.; females, 10.2 gm.—average) is no less than that in other nationalities (Hellmann, 7.9 gm; Herrmann, 11.2 gm; Lucas, 10.6 gm.; Miller, 10.8 gm.). The weight of the adult spleen in Chileans is, however, less than that in other ethnic groups. Jirón says (1939): "Among us the weight of the spleen is from 90 to 100 gm." Henckel and Skewes (1943) established an average of 106.17±3.0 gm. as the absolute weight of the spleen in Chilean males of all ages. Naturally, the weight of this organ depends on the age, a sharp decline in absolute and relative weight being noticed in older people. The authors mentioned have arrived at the averages shown in table 5.

TABLE 5.—*Weight of the spleen in Chilean males (in grams) (from Henckel and Skewes, 1943)*

Age (years)	Absolute weight		Relative weight	
	M	m(M)	M	m(M)
20–30	108.05	3.68	2.05	0.06
31–40	101.91	6.06	1.92	.11
41–50	102.87	7.23	1.73	.12
51–60	79.55	9.29	1.34	.14
61 and over	88.33	20.96	1.58	.14

A comparison of the figures for weight of spleen in Chileans with the corresponding figures for other ethnic groups shows that they are lower than those for Europeans or inhabitants of the United States. (French, 148 gm., average; English, 150 gm.; Germans, 150 gm., etc. See Loth, 1931.) Thus, it is very clear that in adult Chileans the weight of the spleen generally is lower than that of the groups mentioned, although in the newborn no difference whatever is noticeable (Mahn 1933).

Nevertheless, there are other peoples in whom the average weight of the spleen is likewise lower than that of the Europeans and inhabitants of the United States. These include the Negroes and the Japanese, for whom Loth gives the following average weights: Negroes, males, 115 gm., females, 80 gm.; Japanese, males, 93 gm., females 86 gm.

According to Jirón (1939), average dimensions of the adult male spleen are: length 9½ cm., width 6½ cm., and thickness 3 cm.

There is less interest from the point of view of anthropology in the clefts, indentations, etc., on the edges and surfaces of the spleen. (See Loth.) Mahn (1933) and Jirón (1939) furnished some details on this subject.

A complete absence of the spleen was observed by Jirón in only a single case (1939).

Superfluous spleens are rather frequent (14.5 percent) in the newborn (Mahn, 1933).

ENDOCRINE SYSTEM

Unfortunately, we have at present very few data concerning the glands of internal secretion.

Mahn (1933) has ascertained the weight of the adrenal glands (corpora suprarenalia) in newborn babies. The average for males is 5.55 gm. on the right side and 5.67 gm. on the left; corresponding weights for females are: 5.21 gm. and 5.21 gm. Superfluous adrenal glands (corpora interenalia accesoria) were observed in 4.5 percent of cases.

UROGENITAL SYSTEM

Henckel and Skewes (1943) have ascertained the weight of the kidneys. Their conclusions are shown in table 6.

Table 6.—*Weight of the kidneys in Chilean males (in grams) (Henckel and Skewes 1943.)*

Age (years)	Absolute weight		Relative weight	
	M	m(M)	M	m(M)
20–30	290.51	7.36	5.05	0.11
31–40	310.23	9.12	5.34	.15
41–50	322.50	10.86	5.45	.19
51–60	302.73	11.28	5.01	.23
61 and over	265.83	11.26	5.11	.29

Mahn (1933) gives the weight of the kidneys in newborn Chileans as follows: Males, right 13.2 gm., left 13.6 gm.; females, right 12.1 gm., left 12.5 gm.

According to the same author, the horseshoe kidney is found in 0.25 percent of 800 newborn Chileans and the ring-shaped kidney in 0.125 percent of the cases.

A bicornuate uterus was found by Mahn (1933) in two cases (0.58 percent) among 347 newborn Chilean girls.

NERVOUS SYSTEM

W. Muñoz (1935) made a systematic study of the terminal branches of the lower maxillary nerve (nervus alveolaris mandibularis). He discovered several variations: for example, he was able to prove the anastomosis of the lower dental nerve with the lingual nerve in only 22 percent of cases; that of the mylohyoid nerve with the lingual nerve in only 30 percent of cases.

Jirón (1935 a) calls attention to the fact that the classic description of the great sciatic nerve, i. e., that it arises from the top of the sacral plexus, passes beneath the pyramidal muscle, and divides in the popliteal hollow, applies in only 38 percent of cases among Chileans while in the remaining cases (62 percent) there are many variations, all characterized by numerous divisions of the great sciatic.

BLOOD GROUPS

There are still very few data on blood groups among the Chileans. Three statements refer to the frequency of the classic groups A, B, AB, and O in the people of Santiago (Meza, Sanhueza, and Dussert, 1930; Bunster, Sandoval, 1941). Analogous serological studies have not yet been made in other parts of this large country; only a small number of *Mapuche* (*Araucanian*) from the vicinity of Temuco have been examined by Onetto and Castillo (1930).

The results of these studies appear in table 7. The most notable fact in this table is the high percentage of the O-group or the r gene in Chileans.

Table 7.—*Frequency of the classic blood groups and their genes*

People of Santiago	O	A	B	AB	p	q	r	n	Source
	Percent	*Percent*	*Percent*	*Percent*					
Santiago	52.90	32.64	12.80	1.66	0.198	0.084	0.727	242	Meza, Sanhueza, and Dussert (1930).
Santiago	54.50	33.30	10.10	2.10	.199	.066	.738	5500	Bunster (1941).
Santiago	59.12	29.09	9.09	2.70	.170	.057	.769	4200	Sandoval (1941).
Mapuche	75.60	17.20	6.20	.60	.095	.035	.869	382	Onetto and Castillo (1930).

Data on the serological factors M and N are even less abundant than those on classic blood groups. Sandoval (1941) after examining more than 500 people of Santiago obtained the following percentages: M, 41 percent; MN, 51.5 percent; N, 7.5 percent. Henckel, Castelli, and Dal Borgo (1941), who examined 100 *Mapuche* from the vicinity of Temuco, obtained the following percentages: M, 57 percent; N, 9 percent; MN, 34 percent. The respective genes are: for Chileans from Santiago, $m=6.40$, $n=2.74$; for *Mapuche*, $m=7.55$, $n=3.00$. With due reserve it can now be said that the frequency of the gene n is quite low among Chileans.

By combining the classic blood groups with the groups M and N, Sandoval (1941) was able to present the following percentages in the people of Santiago: AM, 14.25 percent; AN, 4.75 percent; AMN, 13.00 percent; BM, 2.75 percent; BN, 0.75 percent; BMN, 4.5 percent; ABM, 1.25 percent; ABN, 0.5 percent; ABMN, 0.75 percent; OM, 22.75 percent; ON, 1.50 percent; and OMN 33.25 percent.

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See also the following.—Fallot and Alezais, 1890; Paula Pontes, 1939; Pontes, 1937; Vinelli-Baptista, 1937–38.

GLOSSARY

PHYSICAL ANTHROPOLOGY

Acrocrany. Breadth-height indices of the skull (basion-bregma height×100/greatest breadth) of 98.0 and higher. For the living (acrocephaly), substituting ear height, it refers to indices of 85.0 and above.

Actinomycosis. A chronic infectious disease of cattle, sometimes transmitted to man, caused by a parasitic fungus.

Allelomorph. One of a pair of **Genes** (q. v.) determining the development of contrasted characters, and believed to occupy equivalent loci in homologous chromosomes.

Allergy. The natural hypersensitiveness of an individual to a foreign substance (antigen), as contrasted with anaphylaxis, which is artificially induced.

Amazónidos. A term used by Imbelloni to describe the physical type of the Indians of the Amazon and Orinoco Basins. Same as Von Eickstedt's "Brasilide Rasse."

Amebiasis. The state of being infected with minute one-celled animal organisms called amebae.

Aneurism. A sac formed by the dilation of the walls of an artery and filled with blood.

Angina. Any disease or symptom characterized by spasmodic suffocative attacks.

Angiology. The sum of knowledge regarding the blood- and lymph-vessels.

Aristencephaly. Skull capacities of 1,451 cc. and above in males, or 1,301 cc. and above in females.

Asthenic. See **Leptosomic.**

Athletic. A term used by Kretschmer to describe the intermediate form between the extreme stout and thin constitutional types.

Auricular. Pertaining to the auricle or ear.

Australoid. Having the physical characters common to native Australians.

Biacromial. Relating to the tips of the acromion processes of the shoulder blades, in the sense of the line or distance between.

Bizygomatic. Relating to the two cheek bones, in the sense of the line or distance between.

Brachycephaly. Length-breadth indices of the head (greatest breadth × 100/ greatest length) between 81.0 and 85.4. When applied to the skull (brachycrany) this term refers to indices between 80.0 and 84.9.

Brachyfacial. Having a short face.

Brevilinear. A term used to indicate the short, stocky constitutional type according to Viola's method.

Calvarium. The skull without lower jaw.

Carabelli tubercle. A small elevation of enamel occasionally seen on the lingual surface of a molar tooth.

Caries, dental. Dissolution and disintegration of the enamel and dentin by the action of acid-producing bacteria and their products.

Cephalic. Pertaining to the head.

Chamaecephaly. Length-height indices of the head (ear height × 100/ greatest length) up to and including 57.6. When applied to the skull (chamaecrany) basion-bregma height is used and the indices include 69.9.

Chamaerrhiny. Nasal indices between 85.0 and 99.9 in the living and between 51.0 and 57.9 on the skull.

Cirrhosis. A disease of the liver, ending in atrophy and degeneration of the organ, which give to it a granular, yellow appearance.

Cholecystitis. Inflammation of the gall bladder.

Cholelithiasis. The presence or formation of gallstones.

Colúmbidos. A term used by Imbelloni to describe the physical type of the Indians of the northwest coast of North America. Same as Von Eickstedt's "Pazifide Rasse."

Cranial. Pertaining to the skull.

Cretinism. A chronic condition associated with defects of the thyroid gland, marked by arrested physical and mental development.

Cysticercosis. The condition of being infected with the larval form of the tapeworm enclosed in cysts.

Dacryon. The metric landmark at the common junction of the frontal, maxillary, and lacrimal bones.

Dermatoglyphics. The name for all the skin patternings of fingers, toes, palms, and soles, as well as for the study thereof.

Diastema. A space. In dentistry, a space between the teeth.

Diastole. The stage of dilatation of the ventricles of the heart.

Diverticulum, Meckel's. An occasional sacculation of the ileum derived from an unobliterated vitelline duct.

Dolichocephaly. Length-breadth indices of the head (greatest breadth × 100/ greatest length) up to and including 75.9. When applied to the skull (dolichocrany) this term includes indices between 70.0 and 74.9.

Dolichoid. Elongated.

Dynamometry. The measurement of the force of muscular contraction.

Echinococcus. A small tapeworm, the larval form of which is occasionally found in humans encased in cysts (cysticercosis).

Embolism. The plugging of an artery or vein by a clot or obstruction which has been brought to its place by the blood-current.

Endocarditis. Inflammation of the lining membrane of the heart.

Etiology. The study or theory of the causation of any disease.

Euencephaly. Skull capacities between 1301 and 1450 cc. in males, or between 1151 and 1300 cc. in females.

Euryprosopy. Morphological face indices in the living (nasion-gnathion × 100/bizygomatic breadth) between 79.0 and 83.9. Used in connecton with the skull it refers to indices between 80.0 and 84.9.

Exanthematic. Pertaining to an eruptive disease.

Fuéguidos. Term used by Imbelloni to describe an Indian physical type found especially among the *Botocudos* and the tribes of Tierra del Fuego. Same as Von Eickstedt's "Lagide Rasse (Küstentypus)."

Gene. A unit of inheritance situated at some particular locus of a particular chromosome and transmitted according to the laws of Mendel.

Glabella. A metric landmark at the most prominent point in the midline between the eyebrows. Also used to designate this region.

Gumma. A soft gummy tumor occurring in the late stages of syphilis.

Hilus. The depression at the entrance and exit of the vessels, nerves, and duct of a gland.

Hominid. Pertaining to the group of mammals to which *Homo*, or mankind, belongs.

Hydatinous cyst. A cystlike tumor, sometimes found in man, which is the encapsulated larval stage of the small tapeworm, *Taenia echinococcus.*

Hyperbrachycephaly. Length-breadth indices of the head (greatest breadth × 100/greatest length) from 85.5 and up. When applied to the skull (hyperbrachycrany) this term includes indices between 85.0 and 89.9.

Hypereuryprosopy. Morphological face indices in the living (nasion-gnathion × 100/bizygomatic breadth) up to and including 78.9. Used in connection with the skull it refers to indices up to and including 79.9.

Hypsiacrocephaly (or **-crany**). A term coined by combining **Hypsicephaly** (or **-crany**, q. v.) and **Acrocephaly** (or **-crany**, q. v.) denoting the upper range of the mean height index (for the skull from about 83.5 up).

Hypsicephaly. Length-height indices of the head (ear height × 100/greatest length) of 62.6 and higher. As applied to the skull (hypsicrany), substituting basion-bregma height, it refers to indices of 75.0 and up.

Index. Usually the ratio between two measurements expressed as a percentage of the larger. Thus, the cephalic or cranial (horizontal) index is: Maximum breadth × 100/maximum length; the morphological face index is: Chin-nasion height × 100/bizygomatic breadth; the nasal index is: Breadth × 100/length. (See, however, the **Pignet index**).

Ístmidos. A term used by Imbelloni to describe the physical type of the Indians of Middle America. Corresponds to a part of Von Eickstedt's "Zentralide Rasse."

Lacrimale. The metric landmark at the point of intersection of the posterior lacrimal crest with the fronto-lacrimal suture.

Láguidos. Term used by Imbelloni to describe an Indian physical type found among the oldest skeletal remains, especially at Lagoa Santo, Brazil. Same as Von Eickstedt's "Lagide Rasse (Berghöhlentypus)."

Lepteny. Upper face indices in the living (nasion-prosthion × 100/bizygomatic breadth) between 53.0 and 56.9. When applied to the skull it refers to indices between 55.0 and 59.9.

Leptoprosopy. Morphological face indices in the living (nasion-gnathion × 100/bizygomatic breadth) between 88.0 and 92.9. Used in connection with the skull it refers to indices between 90.0 and 94.9.

Leptorrhiny. Nasal indices between 55.0 and 69.9 in the living, and up to and including 46.9 on the skull.

Leptosomic. Pertaining to the thin constitutional type. Same as **Asthenic.**

Leptostaphyliny. Palatal indices as determined on the skull, up to and including 79.9.

Lissotrichous. Having straight hair.

Longilinear. A term used to indicate the long, thin constitutional type according to Viola's method.

Lophocephaly. A condition of the skull in which a pronounced sagittal crest is present.

Luetic. Pertaining to or affected with syphilis.

Lymphadenitis. Inflammation of lymph glands.

Maxillo-frontale. A metric landmark at the intersection of the anterior lacrimal crest, or this crest prolonged, with the fronto-maxillary suture.

Melanesoid. Having the physical characters common to the natives of Melanesia.

Mesaortitis. Inflammation of the middle coat of the aorta.

Meseny. Upper face indices in the living (nasion-prosthion × 100/bizygomatic breadth) between 48.0 and 52.9. When applied to the skull it refers to indices between 50.0 and 54.9.

Mesocephaly. Length-breadth indices of the head (greatest breadth × 100/greatest length) between 76.0 and 80.9. When applied to the skull (mesocrany) this term refers to indices between 75.0 and 79.9.

Mesoconchy. Orbital indices between 76.0 and 84.9 (measuring breadth from **Maxillo-frontale,** q. v.), between 80.1 and 85.0 (measuring breadth from **Dacryon,** q. v.), or between 83.0 and 88.9 (measuring breadth from **Lacrimale,** q. v.).

Mesognathy. Gnathic indices (basi-alveolar length × 100/basi-nasion length) between 98.0 and 102.9.

Mesoprosopy. Morphological face indices in the living (nasion-gnathion × 100/bizygomatic breadth) between 84.0 and 87.9. Used in connection with the skull it refers to indices between 85.0 and 89.9.

Mesorrhiny. Nasal indices between 70.0 and 84.9 in the living, and between 47.0 and 50.9 on the skull.

Mesostaphyliny. Palatal indices, as determined on the skull, between 80.0 and 84.9.

Metabolism, basal. The minimal heat produced by an individual in the fasting and resting stage.

Metriocrany. Breadth-height indices of the skull (basion-bregma height × 100/greatest breadth) between 92.0 and 97.9. For the living (metriocephaly) substituting ear height, it refers to indices between 79.0 and 84.9.

Metriometopy. Transverse fronto-parietal indices on the skull (minimum frontal diameter × 100/greatest breadth) between 66.0 and 68.9.

Mongoloid. Having the physical characters common to the Mongolian peoples.

Morphologic. Pertaining to form and structure.

Mutation. The germinal change resulting in the production of an individual having a different genotypic constitution from its parents.

Myology. The study of muscles.

Orthocrany. Length-height indices of the skull (basion-bregma height × 100/greatest length) between 70.0 and 74.9. As applied to the living (orthocephaly), substituting ear height, it refers to indices between 57.7 and 62.5.

Orthognathy. Gnathic indices (basi-alveolar length × 100/basi-nasion length) up to and including 97.9.

Paleoanthropology. The study of the ancient remains of man.

Pámpidos. A term taken over from Von Eickstedt by Imbelloni to describe the physical type of the Indians of southeastern South America, especially Argentina.

Peritonitis. Inflammation of the lining of the abdominal cavity.

Pignet index. A measure of body build obtained by the formula: Stature (cm.) −[chest girth (cm.)+body weight (kg.)].

Plánidos. A term used by Imbelloni to describe the physical type of east-central North America. Same as Von Eickstedt's "Silvide Rasse."

Platyrrhine. A broad nose, indicially corresponding to **Chamaerrhiny** (q. v.).

Polymorph. Having many forms.

Prognathous. Having projecting jaws.

Pueblos-ándidos. A term used by Imbelloni to describe the physical type of the Indians of the Pueblo area of North America and of the Andean area of South America. Combines a portion of Von Eickstedt's "Zentralide" with his "Andide Rasse."

Pyknic. A term used by Kretschmer to describe the stout constitutional type.

Raphé. A ridge or furrow that marks the line of union of the halves of various symmetric parts.

Sepsis, puerperal. Poisoning by the products of a putrefactive process occurring after childbirth.

Somatology. The sum of what is known regarding the body.

Splanchnology. The sum of knowledge in regard to the viscera.

Stenometopy. Transverse fronto-parietal indices on the skull (minimum frontal diameter × 100/greatest breadth) up to and including 65.9.

Subdolichocephaly (better, **-crany**). A term used to classify the length-breadth indices of the skull between 75.0 and 77.76.

Systole. The stage of contraction of the ventricles of the heart.

Tapeinocrany. Breadth-height indices of the skull (basion-bregma height × 100/ greatest breadth) up to and including 91.9. For the living (tapeinocephaly), substituting ear height, it refers to indices up to and including 78.9.

Thrombosis. The formation or development of a plug or clot in a vessel.

Torus. A swelling; a bulging projection.

Ulotrichous. Having wooly hair.

Uvula. A small, fleshy mass hanging from the soft palate above the root of the tongue.

PART 3. THE LANGUAGES OF SOUTH AMERICAN INDIANS

By J. ALDEN MASON

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INTRODUCTION[1]

Even a relatively short sketch of the linguistic conditions of a large area should cover such points as: general features—phonetic, morphological, and lexical—that characterize the languages, and the main points in which they differ from languages of other regions; brief digests of the grammar and phonetics of each independent family or at least of the more important ones; a classification of these families in groups according to phonetic and morphological type; a classification of the component languages of each family in their proper subdivisions as dialects, languages, groups, and stocks, according to degree of linguistic relationship; and a reconstruction of linguistic history and migrations. As regards the aboriginal languages of South America it must be understood at the outset that, as comparatively little reliable data are available upon them, none of the above points can be treated with any approach to thoroughness, and on most of them little can be said at present.

South American Indian languages have no uniform or even usual characteristics that differentiate them from North American languages. The same may be said of American languages fundamentally, as opposed to Old World languages. Languages were formerly grouped into categories according to morphological pattern: isolating, agglutinating, polysynthetic, and inflective, with an implication of evolution and betterment toward the inflecting ideal—of course, of our own Indo-European languages. However, research has shown that, so far as there has been any evolution, the isolating is the last, not the first stage. American languages were once classed with the polysynthetic, with agglutinative tendencies. No such hard-and-fast distinctions can be made; few languages belong definitely to one or another class, and most of them show traits of several classes. This applies equally well to American and to Old World languages; some show tendencies toward inflection, more toward polysynthesis. It is impossible to give any description that would characterize the majority of American Indian languages or contrast them with Old World languages, either from a morphological or a phonetic point of view. Incorporation (of the nominal or pronominal object) was formerly considered one of the characteristics of American languages; this also is missing in many of them.

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[1] Under the title of "Status and Problems of Research in the Native Languages of South America" this Introduction, with slight revision, was read at the annual meeting of the American Association for the Advancement of Science at Cleveland, Ohio, September 15, 1944, as the author's vice-presidential address as incoming chairman of Section H, the section on anthropology. It was later published in Science, vol. 101, No. 2620, pp. 259–264, March 16, 1945.

A classification of languages according to patterns and types being impossible, the only possible one is genetic, based on relationship, common origin, and linguistic history.[2]

The classification of human groups according to their languages is now accepted as the best system for reconstructing historical connections. Cultural elements are too easily adopted to have much historical value; somatological characteristics, though more permanent than linguistic ones, are less readily identifiable in mixture. On the other hand, a proved relationship of two languages at present widely separated indicates a former close connection or identity of the ancestors of their speakers and thus affords important data on human migration. But proof of linguistic relationship is fraught with innumerable difficulties. It is seldom absolute, but depends on acceptance by scholars; on the other hand, it is impossible to prove that two languages are not related.

Merely to ascertain the connection between two languages is far from sufficient to establish a good historical picture. If we knew no more than that Spanish, Italian, German, and Russian are related it would mean little. All the languages of South America may be related; all those of all America may be; conceivably all languages in the world may eventually be proved to have a common descent. In the same sense, all mammals are related, all animals are related, all life had a common origin. Relationship means little unless we know degree and nearness of relationship.

A direct comparison of two distantly related languages seldom yields convincing proof of their connection. A comparison of Polish and English would probably result in a negative decision; it is only because we know the historical linguistics of the Indo-European languages well, with reconstructed roots of words, that the relationship can be proved. On the other hand, no proof would be needed of the relationship of French, Spanish, and Italian; even if we did not know their descent from Latin, the resemblance is obvious. The relationship of dialects such as Catalan, Provençal, and Gallego is even closer and more evident.

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[2] On the classification of languages, and of American Indian languages in particular, see Boas, 1911; Hoijer, 1941; Mason, 1940; Voegelin, 1941; and references and bibliographies therein.

Related languages are grouped in "families" or "stocks," presumed, on present evidence, to be unrelated. These families are then subdivided into divisions, groups, branches, languages, types, dialects, varieties, etc. The terminology is indefinite and there are no established criteria. When families heretofore considered independent are determined to be related, a more inclusive term is required; phylum has been accepted. For instance, if Indo-European, Hamito-Semitic, and Finno-Ugrian are "proved" to be related, as has been posited with considerable ground, they would compose a phylum. Most of the 85-odd "families" of North America, formerly considered independent, are now grouped in relatively few phyla.

Good scientific grammars of South American languages are practically nonexistent, and grammars of any kind, even of the older type based on analogy with Latin grammar, are very few. Comparisons of morphology, one of the important criteria for linguistic connections, are, therefore, in most cases impossible. Most of the classifications are based on lexical grounds, on vocabularies, often short, usually taken by travelers or missionary priests, and generally with the help of interpreters. The recorders were almost always untrained in phonetics and each used the phonetic system of his native language—Spanish, Portuguese, French, German, or English; sometimes Dutch or Swedish. Scientific deductions made on the basis of such material have little claim to acceptance. Yet on many languages, extinct or living, nothing else is available. An independent family should not be posited on the basis of one such vocabulary, no matter how apparently different from any other language. (Cf. *Mashubi.*)

Of many extinct languages, and even of some living ones, nothing is known; of others there are statements that the natives spoke a language of their own, different from that of their neighbors, but without any suggestion as to how different, or that the language was intelligible or unintelligible or related to that of other groups. Of some, only place and personal names remain; of others, recorded lexical data ranging from a few words to large vocabularies and grammatical sketches.

Owing to the magnitude of the field it has been possible for me to make very few independent studies and comparisons of lexical and morphological data with a view to establishing linguistic connections, and even most of the articles published by others in support of such relationships have not been critically studied and appraised. The greater number, and by far the most cogent, of these studies have been written by the dean of South American linguists, Dr. Paul Rivet. Similar studies in *Macro-Ge* languages have been published by Loukotka. In almost all of them the authors were, unfortunately, limited to comparing vocabularies collected by others and pregnant with the faults already herein set forth. Words from lists in one group of languages are compared with words from languages of another group. Rarely are the roots or stems isolated or known, and morphological elements may often be mistaken for parts of stems. Rarely has it been possible to deduce any rules of sound-shift, the best proof of linguistic relationship, or the examples given are too few in proportion to the number of comparisons to carry conviction. Few of these proposed linguistic relationships can be said to be incontrovertibly proved; good cases have been made for many, and many or most of them have been accepted by later authorities, and are accepted herein. Others are of doubtful validity, and all require reappraisal, and reworking, especially those in which new data may later become, or may already have become, available.

It is a truism of linguistic research that, given large enough vocabularies to compare, and making allowances for all possible changes in the form of a word or stem, as well as in its meaning, a number of apparent similarities, convincing to the uncritical, can be found between any two languages. Especially is this true if the comparison is made between two large groups, each consisting of languages of admitted relationship. To carry conviction, laws of sound-shift must be deduced, obeyed by a large proportion of the cases in question, and a basic similarity in morphological and phonetic pattern must be shown. Few of the comparative works on South American languages attempt such obligations, and almost all suffer from the faults above listed. There is not a really thorough comparative grammar of any South American, or for that matter of any American, native linguistic family, except possibly Algonkian.

One of the pitfalls to be avoided in linguistic comparison is that of borrowing. Languages easily adopt words from neighboring languages; these must be discounted in seeking evidence on genetic relationship. Words for new concepts or new objects are likely to be similar in many languages;[3] generally their categories and very similar forms betray their recent origin. Phonetic pattern and morphological traits are also borrowed, but to a lesser degree. Grammatical pattern is the most stable element in a language, phonology next; vocabulary is most subject to change. There are several areas in America where a number of languages with little or no lexical resemblance have a relatively uniform phonology, and/or similar morphological peculiarities.

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[3] See Nordenskiöld, 1922; Herzog, G. 1941. Such words as those for banana, cow, telegraph, are pertinent.

Many American languages, North as well as South, show resemblance in the pronominal system, often *n* for the first person, *m* or *p* for second person. Whether this is the result of common origin, chance, or borrowing has never been proved, but the resemblance should not be used as evidence of genetic connection between any two languages. Many of the languages of central and eastern Brazil are characterized by words ending in vowels, with the stress accent on the ultimate syllable.

In some cases, the amount of borrowed words and elements may be so great as practically to constitute a mixed language. Linguistic students are in disagreement as to whether a true mixed language with multiple origins is possible. Loukotka, in his 1935 classification, considers a language mixed if the foreign elements exceed one-fifth of the 45-word standard vocabulary used by him for comparison. Lesser borrowings he terms "intrusions" and "vestiges." (See also Loukotka, 1939 a.)

The situation is further complicated by the fact that, in a large number of instances, the same or a very similar name was applied by colonists to several groups of very different linguistic affinities. This may be a descriptive name of European derivation, such as *Orejón*, "Big Ears"; *Patagón*, "Big Feet"; *Coroado*, "Crowned" or "Tonsured"; *Barbados*, "Bearded"; *Lengua*, "Tongue." Or it may be an Indian word applied to several different groups in the same way that the *Mayan Lacandón* of Chiapas are locally called "*Caribs*," and the rustic natives of Puerto Rico and Cuba "*Gíbaros*" and "*Goajiros*," respectively. Thus, "*Tapuya*," the *Tupí* word for "enemy," was applied by them to almost all non-*Tupí* groups, "*Botocudo*" to wearers of large lip-plugs, etc. Among other names applied to groups of different languages, sometimes with slight variations, are *Apiacá*, *Arará*, *Caripuna*, *Chavanté*, *Guaná*, *Guayaná*, *Canamarí*, *Carayá*, *Catawishi*, *Catukina*, *Cuniba*, *Jívaro*, *Macú*, *Tapieté*, not to mention such easily confused names as *Tucano*, *Tacana* and *Ticuna*. Many mistakes have been made due to confusion of such names. (Cf. especially, Arda.)

America, and especially South America, is probably the region of greatest linguistic diversity in the world, and of greatest ignorance concerning the native languages. On the very probable presumption that each homogeneous group, tribe, band, or village spoke a recognizable variant dialect or variety, there may have been 5,000 such in South America. The index of Rivet (1924 a) lists some 1,240 such groups (including a few synonyms), and this is far from the total. For instance, in the above index, Rivet lists 13 component members of the small and unimportant Timote family of Venezuela; in his monograph on the Timote (Rivet, 1927 a) he mentions 128 names for local groups, apart from the names of the villages occupied by them.

The multitude of languages in America has often been given as an argument for a comparatively great length of time of human occupation of this hemisphere. This concept presupposes that the first immigrants to America had a common speech. This is unlikely; it is more probable that each migrating group had its specific language, and that the number of presumably independent linguistic families may originally have been even greater than at present. Such a reduction has been the linguistic history of the rest of the world. These "families" may either have had a remote common ancestry or multiple unrelated origins; of the origin and early forms of speech we know nothing. All known "primitive" languages are highly complex and evidently have had a long period of development. Of course, the minor dialects and obviously related languages were differentiated in America.

Since the main migration to America is believed to have been via Alaska, we would expect to find in South America languages of older migrations than in North America, the speech of the earliest migrants forced to the peripheries and to cul-de-sacs by later and more aggressive groups, and also small enclaves of moribund independent linguistic families. This applies especially to southernmost and easternmost South America, and to the speech of natives of paleo-American physical type, such as the *Ge* and the Fuegians.

Regarding extracontinental relationships, many ill-conceived attemps have been made to show connections between South American native languages and Indo-European or Semitic ones; all these are so amateurish that they have been accorded no scientific attention. Dr. Paul Rivet is firmly convinced of the connection between Australian languages and *Chon*, and between Malayo-Polynesian and *Hokan*. Instead of by direct trans-Pacific voyages, he believes that the Australian influence came via the Antarctic during a favorable postglacial period not less than 6,000 years ago.[4] This radical thesis has met with no acceptance among North American anthropologists. The data offered in its support fall short of conviction, but probably have not received sufficient careful consideration.

It is possible that some of the South American languages belong to the great *Hokan* or *Hokan-Siouan* family or phylum of North America. (Cf. *Yurumanguí*, *Quechua*.) Since isolated *Hokan* enclaves are found as far south as Nicaragua, evidence of migrations across Panamá would not be entirely unexpected. A number of languages from Colombia to the Gran Chaco have *Hokan*-like morphological patterns. Dr. J. P. Harrington is convinced of the *Hokan* affiliations of *Quechua*, but his published article (1943) fails to carry conviction, and no other argument for *Hokan* in South America has been presented. Such *Hokan* migrations, if proved, were probably at a relatively early period.

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[4] Rivet, 1925 b, and many other articles. (See bibliography in Pericot y García, 1936, p. 432.)

On the other hand, several of the great South American families have penetrated the southern peripheries of North America. *Chibchan* languages occupied a solid area, with possibly a few small enclaves of other families or isolated languages, as far as the Nicaraguan border, and the probably affiliated "*Misumalpan*" (*Miskito-Sumo-Matagalpa*) would extend this area to cover Nicaragua. *Arawak* and *Carib* extended over the Lesser and Greater Antilles, and the former may have had a colony on the Florida coast.

In 1797 the native *Carib* Indians remaining in the Lesser Antilles, mainly on St. Vincent Island, were transported to Roatan Island off the coast of Honduras. Mixing with the Negro population there, they have spread over much of the coast of Honduras and parts of British Honduras. They now number some 15,000, most of them speaking a *Carib* jargon.

The trend in the classification of American languages has been quite opposite in North and in South America. In the former, radical scholars believe that all the many languages formerly considered independent may fall into six great phyla: *Eskimo*, *Na-Dene*, *Algonkian-Mosan*, *Hokan-Siouan*, *Macro-Penutian*, and *Macro-Otomanguean*, plus the South American phylum *Macro-Chibchan*. In South America, on the contrary, the more recent classifications have increased rather than reduced the number of families or groups given independent status. Most of these new ones, it must be admitted, are one-language families, many of them extinct, and generally based on one or a few short vocabularies that show little or no resemblance to any other language with which they have been compared. These should be considered as unclassified rather than as independent families. It is certain that the number will be greatly reduced as the languages become more intensively studied, but doubtful if it will ever reach such relative simplicity as in North America. Almost certainly the linguistic picture will be found to be far more complex than in Europe and Asia.

One of the main reasons for the great difference in the proposed number of linguistic families in North and South America is that the study of South American linguistics is now about in the same stage as that of North American languages thirty years ago. Since that time many trained students, both in the United States and in México, have studied the native languages intensively, largely under the direction or example of the late Drs. Franz Boas[5] and Edward Sapir. Except for the indefatigable Dr. Paul Rivet and the late Curt Nimuendajú, South America has had few linguistic scholars of wide interests and scientific viewpoint, and until recently very few trained younger men. The North American languages have been grouped into six phyla, mainly on grounds of morphological resemblance and intuition, and in this the students have been aided by the fact that the languages are fewer, and fewer of them extinct, so that such morphological studies could be made. South America suffers not only from lack of students, paucity of grammatical studies, multitudes of languages, extinction of many of them, but also from the practical problems of linguistic research: immense distances, poor transportation, difficulties and expense of expeditions, lack of capable interpreters, and similar handicaps.

The history of attempts to classify the languages of South America was reviewed by Chamberlain in 1907. The earlier classifications, such as those of Adelung and Vater, Balbi, Castelnau, Gilij, Hervás, Ludewig, Von Martius and D'Orbigny, were not considered therein, and need not be here. Modern classification began with Brinton in 1891 (1891 a). With his usual far-seeing good sense, not "curiously enough" as Chamberlain remarks, Brinton refused to enumerate or list his "stocks," but apparently recognized nearly sixty. In many later short articles Brinton continued to alter his groupings. Other lists published in the next few years were McGee, 1903 (56); Chamberlain, [1903] (57); Ehrenreich, 1905 (52). All these differ more than the slight variation in total would suggest. Chamberlain then gave his own list, totalling 83. Later (1913 a) he published a revision of this, which became the standard classification in English for a decade or more. Though the total of 83 stocks is exactly the same as in his earlier list (plus 77a), the number of alterations, deletions, and additions is great.

Since 1922 a number of classifications have appeared. Krickeberg (1922) stressed only the 15 most important families; based on this Jiménez Moreno (1938) published a large distribution map in color. P. W. Schmidt (1926) also wisely did not attempt to enumerate and list every family, but discussed them under 36 families or groups. The late Curt Nimuendajú never attempted a complete linguistic classification of South America, and his unpublished map and index do not include the far north, west and south, but his first-hand knowledge of the rest of the continent is unexcelled. In this restricted region he recognizes 42 stocks, 34 isolated languages, and hundreds of unclassified languages, the latter generally without any known linguistic data.

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[5] See especially "Handbook of American Indian Languages," edited by Franz Boas, Parts 1 and 2, Bulletin 40, Bureau of American Ethnology, Washington, 1911, 1922; Part 3, New York, 1933.

Two comprehensive classifications of all South American languages have been made in the last 20 years. Paul Rivet (1924 a), combining some of Chamberlain's families, separating others, reached a total of 77. Pericot y García (1936) follows Rivet very closely, but not in numerical or alphabetical order. The most recent classification and the most radical—or most conservative, according to the point of view—is that of Loukotka (1935). Dividing more of Rivet's families than he combined, he enumerates 94 families with a total of some 558 languages. Later he revised the details somewhat, but only regarding the languages of Brazil. In this latter article he notes the linguistic sources for each language (Loukotka, 1939 a).

In view of the great uncertainty regarding the relationships and classification of the South American native languages, and the great differences of opinion, the example of Brinton, Schmidt, and Krickeberg is herein followed, in not attempting to enumerate and rigidly to separate the genetic families.

The classification of the languages of South America herein given is, therefore, presented without any pretense of finality or even of accuracy; the data are too insufficient. Future research will indicate many errors and change the picture decidedly. It is hoped that the present article incorporates all the accepted revisions since the appearance of other classifications, and improves on the latter. As regards exactitude and finality I can but cite the opinion of a great linguist:

> To attempt to make an exact and complete classification of all languages in rigorously defined families is to prove that one has not understood the principles of the genetic classification of languages. [Meillet and Cohen, 1924, p. 10.]

South American linguistic history or philology does not extend before the beginnings of the 16th century with the first words and observations made by European voyagers. No native alphabets had been developed; there were no hieroglyphs, and even pictographs, petroglyphs, and picture-writing seem to be less than in North America. The Peruvian quipus were arithmetical, astrological, divinatory, and mnemonic. There was a tradition among the *Quechua* at the time of the Conquest that they had once had a system of writing on tree leaves that was later forbidden and forgotten (Montesinos, 1920, chs. 7, 14, 15; Bingham, 1922, ch. 16; 1930, ch. 9.), but this is given little credence by modern scholars, and no trace of it remains. However, it has recently been suggested that painted symbols were employed by some natives of the North Peruvian Coast (Larco Hoyle, 1944). A system of writing has been claimed for the *Chibcha* also, based, not on tradition, but on the peculiar, and apparently nonpictorial character of many pictographs in Colombia; this also has received no credence among archeologists. On the other hand, the modern *Cuna* of Panamá have developed an interesting existent system of mnemonic picture-writing.[6]

Two of the native languages merit special mention as having become, after the Spanish Conquest, lenguas francas of wider extent and use than formerly. The *Tupí* of the Brazilian coast became the basis of the lingua geral, the medium of communication of priests and traders throughout the Amazon drainage; it is now generally replaced by Portuguese. The Cuzco dialect of *Quechua* became the culture language of the "*Inca*" region and extended its area even before the Conquest; after the latter it continued its spread and was adopted as a second language by the Spanish in Perú. Neither language has today, however, the cultural position of the *Maya* of Yucatán, for instance, though both have added many native terms in the Spanish and Portuguese of their regions, and even throughout the world, such as tapioca, jaguar, llama, and quinine. It has been estimated that 15 percent of the vocabulary of Brazilian Portuguese is of *Tupí* origin. In Paraguay, *Guaraní* is considered a culture language, and some newspapers are published in it.

A description of the geographical area occupied by each language would take too much space. The approximate region may be seen by reference to the large linguistic map and to the tribal sections in the other volumes of this Handbook. In this connection, the point of temporal relativity must be taken into consideration. The habitat given is that of earliest record. Great changes in population and migrations took place during the 16th to 18th centuries and even later, and migrations on a lesser or equal scale must have occurred in preceding centuries. These cannot be recorded on the map, but some are noted in the regional articles in Volumes 1 to 4. These changes took place especially in eastern Brazil and in the Andean region.

In the preparation of this article I have received help, great or little, generally information through correspondence, from Messrs. J. Eugenio Garro, Irving Goldman, John P. Harrington, Frederick Johnson, Jacob Bridgens Johnson, Claude Lévi-Strauss, Erwin H. Lauriault, William Lipkind, Alfred S. Métraux, Bernard Mishkin, Eugene A. Nida, Louis Rankin, A. F. Reifsnyder, Paul Rivet, John Howland Rowe, David B. Stout, Harry Tschopik, Jr., and Charles Wagley. My sincere thanks to these and to all others who may have assisted in any way. Two persons deserve especial mention, credit, and thanks: Betty J. Meggers (Mrs. Clifford Evans, Jr.), who helped greatly with the bibliography; and particularly Mrs. Maria Alice Moura Pessoa, who is largely responsible for the linguistic map as well as for much of the bibliography. A large part, possibly the major part, of the latter was prepared by Works Progress Administration Project No. 18369 in 1939 under the direction of the late Dr. Vladimir J. Fewkes. Mr. Ronald J. Mason also assisted in checking the map.

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[6] Nordenskiöld, "Comparative Ethnological Studies," 7, Göteborg, 1928–1930.

SOURCES

In addition to earlier and outmoded classifications such as those of Gilij (1780–84), Hervás y Panduro (1800), Adelung and Vater (1806–17), Balbi (1826), D'Orbigny (1839), Ludewig (1858), and Martius (1867), about a dozen authors have offered classifications of the South American languages, or of those of large parts of South America. Although their opinions are often mentioned in text, they are generally omitted in the language bibliographies herein because of their constant recurrence, except in those cases, particularly Adelung and Vater (1806–17), Martius (1867), Lehmann, W. (1920), Tessmann (1930), and Jijon y Caamano (1941–43), where they present source material. The more recent classifications, with a brief note on their natures, are as follows:

Alexander Chamberlain, "Linguistic Stocks of South American Indians" (1913 a). This 12-page article is the last of several such by Chamberlain. It enumerates his 84 families with several bibliographical references to each, all of which may be found in the references herein. The accompanying map is small.

Paul Rivet, "Langues de l'Amérique du Sud et des Antilles" (1924 a)—a 69-page part of Meillet and Cohen's "Les Langues du Monde" (1924). Under each of his 77 families Rivet briefly notes the component languages in their groupings and with their locations, in text—not in tabular—form. Over a thousand languages (or dialects) and synonyms are mentioned, and the very full index, containing about 1,250 names of South American languages, is most useful. The bibliography consists of only 82 items, all of which are included herein. It is followed by a 4-page article on "L'ecriture en Amérique." Several large folding maps are included.

Čestmir Loukotka, "Clasificación de las Lenguas Sudamericanas" (1935). This is a small and rare pamphlet of 35 pages. In tabular form he lists his 94 families with the component languages (*Arawak* has 89) in groups or divisions. Extinct languages are so marked. Loukotka notes languages that, in his opinion, are mixed, or that have "intrusions" or "vestiges" of other languages. This is in accord with his comparisons of a 45-word standard vocabulary; the language is "mixed" if it contains more than one-fifth of foreign words, has "intrusions" or "vestiges" if foreign words are few or very few. There is no bibliography and no map.

Wilhelm Schmidt, "Die Sprachfamilien und Sprachenkreise der Erde" (1926). The South American section comprises 59 pages.

Schmidt wisely does not enumerate his families but mentions most of the languages with their locations, and has classificatory charts for the larger families. Many references are given in text, some of which may be missing in the bibliography herein. Maps are provided in a separate atlas. The index is large. The second half of the book is devoted to "Die Sprachenkreise und Ihr Verhältnis zu den Kulturkreisen," where the phonologies, grammars, and syntaxes of the languages of the world are compared. To my knowledge, this is the only place where the little that is known about the morphology of South American languages may be found in one work. A digest and critique of Schmidt's *kulturkreis* as it applies to South American languages should have formed a section of the present monograph.

Daniel G. Brinton, "The American Race" (1891 a). Although Brinton covers briefly all phases of American anthropology, his groupings are on a linguistic basis and his linguistic interests very great. He wisely does not enumerate his families but gives tables of the component languages of the principal families, with their locations. To prove relationships he gives comparative vocabularies and considerable linguistic data, comments, and arguments. He was the first to suggest some relationships but naturally much of his work is out of date. The bibliographical references are rather numerous, and probably some are missing in the bibliographies herein. No map is provided.

L. Pericot y García, "América Indigena" (1936). Like Brinton, Pericot covers all phases of the American Indian. He follows Rivet in mentioning very many small groups with their locations, also not in tabular form. He has a section (pp. 94–106) on "Carácteres lingüísticos." Most valuable are his voluminous bibliographical references with digests which, for South America, fill 36 pages (pp. 692–727) of concise data. Probably not all the bibliographical references are included herein. There are many detailed maps of parts of South America.

Walter Krickeberg, "Die Völker Südamerikas" (1922) in Georg Buschan's "Illustrierte Volkerkunde," vol. 1, pp. 217–423 (1922). Krickeberg devotes some pages, especially 219–227, to linguistic features, and other remarks, passim, but gives no classificatory tables or charts. A small map, which formed the basis for the map of Jiménez Moreno (México, 1936), shows most of the families, and the principal component members of each, according to his opinions, which are generally those of consensus. The bibliography is relatively small.

Although not including all of South America, the following four works deserve especial mention for their large and full coverage:

Čestmir Loukotka, "Linguas Indigenas do Brasil" (1939 a). Like

Loukotka's pamphlet issued in 1935 (see above) this is a concise table of families and component languages, rigidly restricted to Brazilian territory. The name, locale, and principal references for source material are given for each group. "Intrusions," "vestiges," and mixed languages are noted. Symbols denote whether a language is extinct, and if the data on it are poor. A map is included, and 10 of the 28 pages are devoted to a large and excellent bibliography of source material, all of which items are included herein.

Jacinto Jijón y Caamaño, "El Ecuador Interandino y Occidental" (1943). This is volume 3 of Jijón's monumental work of this title (1941–43). Half of the volume, chapter 30 (pp. 390–654), is devoted to "Las Lenguas del Sur de Centro America y el Norte y Centro del Oeste de Sud-América." It covers east to longitude 60° (*Wapishana-Nambicuara-Ashluslay*), and to latitude 30° S. Thus he largely supplements Loukotka (1939 a), though both omit the *Araucanian*-Patagonian region. He is especially strong in the Colombia-Ecuador-Perú area. Territory and many source references are given for each language, together with arguments regarding their classification. Eight folding maps accompany the volume. Most if not all of the bibliographical references are included herein.

Günter Tessmann, "Die Indianer Nordost–Perus" (1930). Tessmann covers much of eastern Perú and Ecuador most thoroughly. Fifty tribes are considered. His section 76 under each of these gives the known linguistic data, together with vocabularies, known data on morphology, and the most important source references, most of which, naturally, are included herein. A special section (pp. 617–627) is on "Sprachliche Verwandschaft" and includes (pp. 624–626) a table giving his radical ideas regarding linguistic classification. The accompanying maps are small.

Walter Lehmann, "Zentral Amerika; Die Sprachen Zentral-Amerikas" (1920). These two large volumes afford a mine of information on the languages from southern México to western Ecuador. All the source material, books, and documents have been studied, mentioned, digested, and much of it reproduced. The bibliography is probably nearly complete to that date. The several very large maps contain much printed information, and cover a wider area than the text, including parts of western Venezuela and Brazil and northern Perú. Many of the bibliographical references are not included herein.

Curt Nimuendajú's unexcelled first-hand knowledge of the peoples and languages of Brazil was apparently hardly superior to his knowledge of the literature. He had definite ideas on the classification of languages but, unfortunately, never published them. They often disagreed with those of others but, since his opinions were often based on actual acquaintance, they merit careful consideration. He submitted a very large and very detailed map, an alphabetical list of tribes with references to location on map, and a very complete bibliography. On the map the tribal names were underlined with color in accord with a linguistic family color chart. As a great number of colors were employed, it is possible that occasional errors were made in transferring the familial linguistic affiliation, according to his opinions, from the map to the tribal index. His map did not include the Andean region, or the far south.

See also the following references, which are very incomplete, and mainly relatively recent:

ADDITIONAL REFERENCES

GENERAL

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THE MESO-AMERICAN LANGUAGES

In the Meso-American area considered within the scope of this Handbook are found representatives of all four of the great linguistic phyla of México and Central America, the *Hokan-Siouan*, *Macro-Penutian*, *Macro-Otomanguean*, and *Macro-Chibchan.* The first two are also widespread in the United States. Only a very few of the languages of the first three phyla are here included; none of them extends south of Costa Rica. The *Macro-Chibchan* phylum is primarily a South American entity and is mainly treated of later herein; it did not extend north of Honduras. These languages, with their appropriate bibliographies, are discussed more fully in J. A. Mason (1940) and Johnson (1940). (See also Johnson, Handbook, vol. 4, pp. 63–67.)

HOKAN-SIOUAN

The two small Meso-American languages belonging to the great *Hokan-Siouan* phylum are of the Hokaltecan (*Hokan-Coahuiltecan*) subphylum. There are only a few small and widely separated enclaves of this phylum south of the large groups in northern México. Nevertheless, there are indications of related languages in South America (see especially *Yurumanguí*, and J. P. Harrington, 1943), and many "families" in a long belt from Colombia to the Gran Chaco seem to have a *Hokan* type of morphology.

The two languages under consideration are *Subtiaba* and the tiny enclave *Maribichicoa.* The true and earlier name for the language is *Maribio.* They are grouped with the *Tlapanec* of Guerrero, México, under the name *Supanec.*

MACRO-PENUTIAN

The *Macro-Penutian* phylum is a rather hypothetical one, the relationship of the putative components not yet proved to general satisfaction. One probable member, *Utaztecan*, has languages in the Meso-American area; another, the *Mayan*, and a less certain member, the *Xincan*, abut on this area. Another doubtful component, the *Lencan*, is included in the region. Two other stocks in this area, *Jicaquean* and *Payan*, are also possibly *Macro-Penutian* but more likely *Macro-Chibchan*. However, all four, *Xinca*, *Lenca*, *Jicaque*, and *Paya*, are best considered unclassified for the present.

UTAZTECAN

This stock, of great importance in México, has several enclaves in the Meso-American area. They probably belong to two different migration periods, an older one of *Nahuatl* languages, including *Nicarao*, *Nahuatlato*, *Bagace*, and *Pipil*, and a later one of *Nahuatl*, consisting of a few small isolated enclaves, probably of *Aztec* traders or colonists, known as *Desaguadero* and *Sigua*.

MACRO-OTOMANGUEAN

The Meso-American *Macro-Otomanguean* languages all belong to the *Manguean* family. All are on the west coast and all extinct. Three languages are distinguished: *Choluteca* or *Chorotega*, *Mangue* (with the divisions or dialects *Diria* and *Nagrandan*), and *Orotiña* (with the divisions of *Orosi* and *Nicoya*).

LENCAN, JICAQUEAN, AND PAYAN

Authorities disagree greatly as to the affinities of these three "families," which consist of one language each, the dialects being negligible. Some see *Chibchan* elements in all, some *Macro-Penutian* (*Mizocuavean*) elements in all. The former are naturally stronger in *Paya*, the latter stronger in *Lenca*. All three may be related, but the differences between them, and between each and other languages, are so great that they had best be considered isolated or unclassified for the present.

MACRO-CHIBCHAN

Most of the languages of Panamá and Costa Rica are admittedly *Chibchan*, and most of those of Nicaragua and southeastern Honduras are *Misumalpan*, probably of the *Macro-Chibchan* phylum. These are treated later under *Chibchan*. The possible relationship of *Paya*, *Jicaque*, and *Lenca*, in descending order of probability, is considered above. *Cacaopera* is a *Matagalpan* enclave in *Lenca* territory.

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This field is completely covered in Walter Lehmann's "Zentral-Amerika; Die Sprachen Zentral-Amerikas, II" (1920). Lehmann not only gives practically every source until that date but republishes all the lexical material. Only the more important sources, all given in Lehmann, are noted here:

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Utaztecan.—(The bibliography of *Utaztecan*, especially of *Nahuatl* or *Aztec*, is enormous, but that of the Central American groups is small.) *Pipil:* Scherzer, 1855. *Nikira:* Squier, 1853.

Macro-Otomanguean.—*Chorotega*: Squier, 1852, 1853. *Mangue*: Brinton, 1886 c. *Diria:* Squier, 1852. *Nagrandan:* Squier, 1852, 1853.

Lenca.—Hernández, E., and Pinart, 1897; Membreño, 1897; Peccorini, 1910; Sapper, 1901; Squier, 1858; Stoll, 1884.

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CHIBCHAN

Chibchan is one of the stocks of major importance in South America. Its area is extensive, its members many and some of them large, and in former days it probably covered a wider area, especially to the south. Some of the languages have become extinct, a number of them without linguistic record, so that their *Chibchan* relationships are assumed from indications of geographical position, place names, statements of early sources, etc. The language of highly cultured peoples, among others the *Chibcha* or *Muisca* of the Bogotá region, it failed to become a standard language, like *Aztec* or *Quechua*, or a lingua franca like *Tupí*. The *Chibchan* languages occupy a prominent position in the question of intercontinental relationships, since the family is the only one that extends into North America. The *Chibchan* languages extended over all Panamá, most of Costa Rica and Nicaragua, and may have included the *Jicaque* and *Paya* of Honduras. (See preceding section; also Mason, 1940; Johnson, 1940.) They may have come into contact with the *Maya*. This is important in view of Schuller's belief in a great phylum that includes *Maya*, *Chibcha*, *Carib*, and *Arawak* (Schuller, 1919–20 a, 1928).

The *Chibchan* "family" seems to be one of those (see *Quechua*) with a morphology somewhat resembling *Hokan*, though lexical proof of genetic connection still remains to be advanced. Jijón y Caamaño (1941–43), therefore, proposes a great "super-phylum" *Hokan-Siouan-Macro-Chibcha*. Rivet has been studying a new vocabulary of *Yurumanguí* (q. v.) and comparing it with *Hokan* with some favorable results.

Formerly almost all the languages of highland and coastal Colombia were considered to belong to the *Chibchan* group, but recent opinion assigns the *Chocó* [7] and most of the other groups of northern Colombia, except for the Bogotá *Chibcha* and the *Arhuaco* region, to the *Carib*

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[7] The *Cuna* and *Chocó* are linked culturally, and apparently linguistically, in other sections of this Handbook (vol. 4, pp. 49–51).

(q. v.). This is presumed to be the result of a relatively recent but pre-Columbian migration that supplanted former *Chibchan*-speaking peoples.

The subdivisions of *Chibchan* differ very greatly in the former classifications of W. Schmidt (1926), Loukotka (1935), W. Lehmann (1920), Rivet (1924 a), and others, and the latter has changed his opinion greatly. As a tentative basis, therefore, the latest classification, that of the Ecuadorean Jijón y Caamaño (1941–43), who has made a special study of this region, is herewith presented, without implication of definite acceptance as proved.

Jijón y Caamaño places in his *Macro-Chibchan* phylum a number of languages heretofore considered as independent "families," and divides it into eight primary groups:

A. Paleo-*Chibcha* (*Esmeralda-Yaruró*)
B. *Chibcha*
C. *Timote*
D. *Cofan*
E. *Murato*
F. *Mosquito-Xinca*
G. *Puruhá-Mochica*
H. *Cholona*

Of these, only group B was formerly considered *Chibchan*, and only that is considered immediately below.

Jijón y Caamaño divides his *Chibchan* languages into four groups: Archaic or Western, Pacific Intermediate, Inter-Andine Intermediate, and Evolved or Eastern. Each of these is divided into subgroups with numerous languages.

Rivet in his latest *Chibcha* classification (1943 a) divides the *Chibchan* languages into 10 groups:

1. *Barbacoa*
2. *Coconuco*
3. *Páez*
4. *Chibcha* Proper
5. *Changina*
6. *Cuna*
7. *Guaymí*
8. *Talamanca*
9. *Andaquí*
10. *Guatuso*

Many of these represent one of Jijón y Caamaño's subgroups, but there is considerable disagreement.

CHIBCHAN LANGUAGES OF CENTRAL AMERICA [8]

Most of the languages of Panamá and Costa Rica are of recognized *Chibchan* affinities, and most of those of Nicaragua belong to the

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[8] See alternative classification in Handbook, vol. 4, pp. 64–66.

"Misumalpan (q. v.) Stock," a hybrid name proposed by Mason (1940) and Johnson (1940) for the *Miskito* (*Mosquito*), *Sumo*, and *Matagalpa* families. The *Paya* and *Jicaque* families of Honduras may also be related to *Chibcha*, and members of the "*Macro-Chibchan* Phylum."

The true *Chibchan* languages of Central America are divided into a number of groups. No authors agree upon this point. Mason (1940) and Johnson (1940) propose four groups, Rivet (1943) six. *Rama* (vide infra) Rivet places in his fourth or *Chibcha* Proper Group. The other groups he terms "*Changina*," "*Cuna*," "*Guaymí*," and "*Talamanca*."

Jijón y Caamaño (1941–43) divides the Central American *Chibchan* languages into five groups. The languages of the *Talamanca*, *Guatuso*, and *Cuna* groups he places with the *Barbacoan* languages to form his Western or Archaic Group. Jijón y Caamaño does not differentiate Rivet's *Guaymí* and *Changina* groups but puts them together with some western Colombian languages into his second, or Pacific, Group. He agrees with Rivet in separating *Rama* and *Melchora* from the others and places them, together with *Chibcha* Proper, in the Eastern Group of evolved languages. He and Rivet are in relative agreement as regards the component languages of each subgroup.

The *Cuna* group is often termed "*Cueva-Cuna*." The subgroups seem to be:

I. Island
    A. *San Blas* (*Tule* or *Yule*)
    B. *Caimanes*
II. Mainland
    A. *Cuna* (*Chucunake* and *Bayano*)
    B. *Cueva* (*Coiba*)

Cueva and *Cuna* were very closely related, yet separate. *Chucunake* and *Bayano* are local names, not dialects. *Mandinga* is a hybrid negroid group; *Secativa* is not a dialect.

Cuna is isolating in general character; word order is fundamental in sentences. Reduplication is frequent. Suffixing clearly predominates over prefixing.

Mason's (1940) *Guaymí-Dorasque* subfamily is accepted by Jijón y Caamaño, but Rivet (1943) divides it into two, *Changina* and *Guaymí*. In the former group, together with *Chumulu*, *Gualaca*, and *Changina*, probably go the extinct *Dorasque* (*Torresque*), and probably *Burica* and *Duy*. *Bukueta* is a synonym or dialect of *Sabanero; Muite* is a dialect in the *Guaymí* subgroup. W. Lehmann (1920) gives the following divisions of *Dorasque: Dolega*, *Chumulue*, *Iribolo*, *Chiriluo*, *Suasimi*, and *Zuri*. With *Changina* apparently belongs *Chaliva* (*Saliba*, *Soriba*, *Sariba*, *Shelaba*).

Valiente, *Talamanca*, *Viceita*, *Urinama*, *Tariaca*, and *Pocosí* are probably dialects of *Bribri*. *Tojar*, *Teshbi*, *Depso*, *Lari*, and *Uren* seem to be dialects of *Térraba*. *Boruca* is a synonym of *Brunca;* apparent dialects of this subgroup are the extinct *Kepo*, *Coto*, *Burucaca*, *Turucaca*, and *Osa*. Important languages not mentioned by Rivet that seem to fall in the *Talamanca* group are *Guetar*, *Voto*, and *Suerre* (*Turricia*). With *Cabecar*, according to W. Lehmann (1920), goes *Corrhue;* and with *Tucurrike* go *Orosi*, *Cachi*, *Sakawhuak*, and *Sechewhuak*.

Guatuso, with its variety *Corobici* or *Corbesi*, and *Rama* with its dialect *Melchora*, are obviously very different from each other and from other Central American *Chibchan* languages, and Mason (1940) was evidently in error in making a *Rama-Corobici* subfamily. Both Rivet (1943) and Jijón y Caamaño (1941–43) place *Rama* with the languages of *Chibcha* proper. Rivet puts *Guatuso* in a class by itself, and Jijón y Caamaño makes it a subgroup of his Western Group.

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CHIBCHA PROPER

The *Chibchan* languages that have been grouped in the *Chibcha* Proper group are widely scattered, containing not only some in central Colombia but those of the Sierra Nevada de Santa Marta and some of Nicaragua. Rivet (1943) lists the following five main languages:

Muisca or *Chibcha* (*Muysca, Mosca*)
Tunebo or *Tame*
Guamaca
Cágaba (*Köggaba*) or *Arhuaco* (*Aruaco, Aruak*)
Rama

Jijón y Caamaño (1941–43) also places all of these languages in his Eastern or "Evolved" group, which he divides into three subgroups, *Cundinamarca* (*Muisca-Tunebo*), *Arhuaco* (*Cágaba-Guamaca*), and Central American (*Rama-Melchora*).

Other important languages or dialects of the *Muisca-Tunebo* subgroup are *Duit*, *Sínsiga*, *Pedrazá*, *Guasico*, *Chita*, *Fusagasucá*, and *Morcote*. *Duit* seems to be closely related to *Muisca*. *Pedrazá* is claimed to be a *Tunebo* dialect. *Morcote* seems to be rather variant. Though *Sínsiga* is generally considered closely related to *Tunebo*, W. Lehmann (1920) believes it closer to the *Cágaba-Arhuaco* group, and to form a connecting link between the latter and the central *Chibchan* languages.

Languages or dialects of the *Cágaba-Arhuaco* subgroup are *Guamaca*, *Atanke* (*Atanque*), *Bintucua*, and *Ica* (*Busintana*). *Chimila* (q. v.) has been placed by some in the *Dorasque-Guaymí* group. W. Schmidt (1926) places *Tunebo*, *Andaquí*, and *Betoi* in this central *Chibchan* subgroup.

If the *Rama* on the border of Nicaragua and Costa Rica, apparently the northernmost of the true *Chibchan* languages, really belongs in the central subgroup, this has important historical implications. *Melchora* is apparently a dialect.

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Tunebo.—Rivet, 1924 b; Rivet and Oppenheim, 1943; Rochereau, 1926–27; Anonymous, 1926–27.

Cágaba.—Anonymous, 1919 e; Bolinder, 1925 (*Ica*); Celedón, 1886 (*Köggaba, Guamaca, Bintukua, Atankez*), 1892 a (*Atanquez*), 1892 b (*Bintucua*); Isaacs, 1884 (*Binticua, Guamaca*); Preuss, 1919–27, 1925.

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COLOMBIAN SUBGROUP

Jijón y Caamano (1941–43) divides his Pacific Group into an Isthmian subgroup of Central American languages, and a Colombian group. In the latter he places *Chimila*, *Yurumanguí*, and possibly a number of unimportant languages: *Timba*, *Lile*, *Yolo*, *Jamundi*, *Yamecí*, and *Aburrá*. None of these is classified by Rivet in 1943. (See separate sections on *Yurumanguí*, *Chimila*, and *Tairona*.)

INTER-ANDINE GROUP

Jijón y Caamaño's Inter-Andine Group consists of a number of languages that Rivet (1943) divides into two groups, the *Coconuco* and the *Páez*. Like *Barbacoa*, independent *Coconucan* and *Paniquitan* (*Páez*) families were formerly accepted. Some authorities placed all this group in their *Barbacoan* family. *Totoró*, *Coconuco*, *Moguex*, and *Guanaco* are the important and generally accepted members of the

Coconuco subgroup. Other probable members are *Guambiano*, *Polindara*, and *Puben* or *Pubenaro*. Jijón y Caamaño (1941–43) places in this or a closely related group *Popayán* (*Popayanense*), *Malvasa*, *Timbia*, and possibly *Panzaleo* (q. v.) and *Quijo* (*Kijo*) (q. v.).

Páez and *Paniquitá* are apparently closely related, as both Rivet and Jijón y Caamaño agree. Otero (1938–39) calls *Paniquitá* a subdialect of *Páez*. W. Lehmann (1920) wrote that the relationship between *Páez* and *Moguex* (*Coconucan*) is quite evident. Formerly *Pijao*, *Panche*, and *Patángoro* (*Palenque*) were also placed in this group, but both Rivet and Jijón y Caamaño agree that these belong, together with *Chocó*, to the *Carib* family.

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BARBACOA GROUP

Barbacoa was considered a separate stock by Brinton (1891 a) and Chamberlain (1913 a), but is now generally accepted as related to *Chibcha*. Jijón y Caamaño (1941–43) places the *Barbacoa* languages with *Talamanca*, *Guatuso*, and *Cuna* to form his Western Group, and divides them into two divisions, *Pasto* and *Caranki-Cayapa-Colorado*. Rivet (1943) mentions only *Coaiquer* (*Cuaiker*), *Cayapa*, and *Colorado*. These seem to be the most important languages, but Jijón y Caamaño (1941–43) mentions *Nigua* in the *Cayapa-Colorado* branch, and *Pasto*, *Colima*, and *Muellamuese* in the *Pasto* branch. Rivet (1924 a) thinks that *Pasto* is *Tucano*. Jijón y Caamaño (1941–43) states that *Telembi* is the same as *Coaiquer* and that W. Lehmann (1920) was wrong in distinguishing them, but that *Cayapa* and *Iscuande* are not the same as *Coaiquer*, as Barrett (1925) believed. *Pichilimbi* probably belongs in this group. Other languages placed in this group by some authors but not accepted by either Rivet or Jijón y Caamaño are *Manabita* and *Latacunga*. In his 1943 classification, Jijón y Caamaño places *Quillacinga* (*Killacinga*) and *Sebondoy* with his Eastern Group, but in a map (map II) he groups them with the *Barbacoa* languages. (See *Coche*.)

The relationship of the *Barbacoa* languages to the doubtful *Esmeralda* family and the *Yunga-Mochica* has been largely discussed;

Esmeralda may well be *Chibchan.* W. Lehmann (1920) compared *Colorado* and *Mochica* and found only three words that hint at affinity.

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ANDAKÍ (ANDAQUÍ)

The extinct *Andakí* of the southern Colombian Highlands must not be confused with the living *Andoke* of the southeastern Colombian forests; the latter are either *Witotoan* or independent linguistically. The *Andakí* were also formerly considered independent; following Brinton (1891 a), Chamberlain (1913 a) put them in the *Andaquian* family. All modern authorities agree that their language was *Chibchan,* probably of the *Chibcha-Arhuaco* subgroup. Jijón y Caamaño (1941–43) and Schmidt (1926) place the language with the *Chibcha* Proper Group, Rivet (1924 a) in a class by itself. Loukotka (1935) considers it a mixed idiom and sees vestiges of *Mashacalí* and *Caingang* in it, a rather unlikely possibility. Igualada (1940) says that no *Andakí*-speaking Indians were found up to 1940 in the Colombian Caquetá area; the modern *Andakí* and *Agüenunga* descendants speak "*Inga*" (*Quechua*) and Spanish. (See also Hernández de Alba, Handbook, vol. 2, p. 922.)

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BETOI GROUP [9]

The extinct *Betoi* adjoined the *Tucanoan Betoya,* from whom the *Tucano* (q. v.) family was formerly named (*Betoyan*). The *Betoi* language is now generally believed to have been *Chibchan* in affinities. Jijón y Caamaño (1941–43) and Schmidt (1926) place *Betoi* with the *Chibcha* Proper languages. With them were probably associated *Girara* and *Lache.* W. Lehmann (1920) believes that *Caquetío,* generally classed as *Arawak,* was also related. Nimuendajú (index) leaves *Lache* unclassified. Loukotka (1935) adds *Situfa.*

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[9] See Hernández de Alba, Handbook, vol. 4, pp. 393–394.

Bibliography.—Gumilla, 1745.

CHIBCHA[1]

- I. Western
  - A. *Talamanca*
    - 1. *Guetar*
    - 2. *Quepo*
    - 3. *Cabecar*
    - 4. *Estrella*
    - 5. *Chiripó*
    - 6. *Tucurrike*
    - 7. *Suerre*
    - 8. *Bribrí*
      - a. *Pocosi,*
      - b. *Tariaca*
    - 9. *Terraba*
    - 10. *Brunca* (*Boruca*)
    - 11. *Tirribí*
    - 12. *Voto*
    - 13. *Coto*
  - B. *Barbacoa*
    - 1. *Pasto*
      - a. *Pasto*(?)
      - b. *Coaiker*(?)
      - c. *Muellamuese*
      - d. *Colima*
      - e. *Patía*
      - f. *Sindagua* (*Malba*)
    - 2. *Cayapa-Colorado*
      - a. *Colorado*
      - b. *Nigua*
      - c. *Cayapa*
      - d. *Caranki*
  - C. *Guatuso*
    - 1. *Guatuso-Corobici*
  - D. *Cuna*
    - 1. *Cuna* (*Coiba, Cueva, San Blas*)
- II. Pacific
  - A. Isthmian (*Guaymí*)
    - 1. *Murire*
    - 2. *Muoi*
    - 3. *Move*
    - 4. *Valiente*
    - 5. *Penonomeño*
    - 6. *Changuena*
    - 7. *Dorasco*
    - 8. *Chumula*
    - 9. *Gualaca*

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[1] Based on Jijón y Caamaño, 1941–43.

CHIBCHA—Continued

- II. Pacific—Continued
  - B. Colombian[2]
    - 1. *Timba*
    - 2. *Lile*
    - 3. *Yolo*
    - 4. *Jamundí*
    - 5. *Yamecí*
    - 6. *Aburrá*
- III. Inter-Andine[3]
  - A. *Páez*
    - 1. *Páez*
    - 2. *Panikitá*
    - 3. *Killa*
  - B. *Coconuco*
    - 1. *Totoró*
    - 2. *Polindara*
    - 3. *Moguex* (*Guambía*)
    - 4. *Coconuco*
    - 5. *Guanaco*
    - 6. *Pubenaro* (?)
  - C. *Popayanense*
    - 1. *Popayán*
    - 2. *Puracé*
- IV. Eastern[4]
  - A. *Cundinamarca*
    - 1. *Chibcha-Muisca*
    - 2. *Duit*
    - 3. *Sinsigá*
    - 4. *Tunebo*
  - B. *Arhuaco*
    - 1. *Cágaba*
    - 2. *Bintucua*
    - 3. *Guamaca*
    - 4. *Atankez*
    - 5. *Sanha*
    - 6. *Ica*
  - C. Central America
    - 1. *Rama*
    - 2. *Melchora*

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[2] All of the below are of very questionable affinities. Jijón y Caamaño (1941–43) also places in this group *Chimila* and *Yurumanguí*, on which see separate articles herein.

[3] Hernández de Alba (Handbook, vol. 2, p. 922) places the *Páez* and *Coconuco* subgroups, together with the *Pijao* subgroup (see "Chocó and Other Possibly Cariban Languages of Colombia" herewith) in the *Talamanca-Barbacoa* group of *Chibcha*. Jijón y Caamaño (1941–43) places in his Inter-Andine group also *Panzaleo* and *Quijo*, on which see separate articles herein.

[4] Jijón y Caamaño (1941–43) also places in this group *Andakí* and *Betoya*, on which see separate articles herein, and *Quilla*, *Quillacinga*, and *Sebondoy-Mocoa*, for which see *Coche* herein.

LANGUAGES PROBABLY OF CHIBCHAN AFFINITIES

Several other extinct languages of western Colombia and Ecuador are generally believed to have been of Chibchan affinities. Among these are:

PANZALEO

Jijón y Caamaño (1941–43) believes that *Panzaleo* was most likely related to *Chibcha*, though it may have been affiliated with *Puruhá-Mochica* (*Yunga*). He places it questionably in his Inter-Andine group, probably most closely related to the *Coconuco* subgroup. Uhle suggested a relationship with *Subtiaba* (*Hokan*). (See Murra, Handbook, vol. 2, p. 795.)

Bibliography.—Jijón y Caamaño, 1941–43, vol. 1, ch. 10; vol. 3, ch. 29.

CARA AND CARANKI

The cultured *Cara* (*Scyri*) had apparently given up their original language in favor of *Quechua* even before the Spanish Conquest. There are some reasons for the opinion that it was of the *Barbacoa* Group, where it is placed by Rivet (1924 a), but its affiliation will probably never be certainly known. Murra (Handbook, vol. 2, p. 792) states that it was similar to *Pasto* and *Cayapa*.

Bibliography.—Buchwald, 1908 b; Jijón y Caamaño, 1941–43, 1:234–285.

KIJO (QUIJO)

The *Kijo* abandoned their native tongue in favor of *Quechua* very early, possibly before the Spanish Conquest; its nature is, therefore, very controversial. It is generally placed with *Cofán* (q. v.), but may have been more closely related to *Chibcha*. Jijón y Caamaño (1941–43) places it questionably with *Panzaleo* in his Inter-Andine Group of *Chibcha*. (See Steward and Métraux, Handbook, vol. 3, p. 652.)

Bibliography.—Jijón y Caamaño, 1941–43; 1:290–295; Tessmann, 1930, p. 237 ff.

MISUMALPAN

"*Misumalpan*" was the new hybrid term proposed by Mason (1940) for the group consisting of the former linguistic families *Misquitoan* (*Miskito*),[10] *Suman*, and *Matagalpan* in Nicaragua and southern Honduras. They were there considered to compose a stock of the *Macro-Chibchan* phylum. *Paya* and *Jicaque* of southern Honduras may be related more distantly. Jijón y Caamaño (1941–43) lists them as group F of the phylum. This group he terms "Group *Misquito-Xinca*," evidently including in it the *Xinca* of San Salvador, and by inference the *Lenca* of Honduras, two groups considered by

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[10] The earlier term is *Mosquito;* Mason preferred the more modern form *Miskito*, but the editors of this volume, the former. Both forms of the word are used therein.

Mason (1940) to be more likely affiliated with the *Macro-Penutian* phylum of North America.

MISUMALPAN

- I. *Miskito*
  - A. *Miskito*
    - 1. *Tawira*
      - a. *Tawira*
      - b. *Mam*
      - c. *Wanki*
      - d. *Baldam*
      - e. *Cabo*
- II. *Sumo*
  - A. *Ulva*
    - 1. *Ulva*
      - a. *Ulva* (*Ulua*)
      - b. *Prinsu*
      - c. *Cucra*
  - B. *Yosco*
    - 1. *Yosco*
  - C. *Sumo*
    - 1. *Tawahca*
      - a. *Twahca*
      - b. *Lacu*
      - c. *Coco*
      - d. *Wasabane*
      - e. *Pispi*
    - 2. *Panamaca*
      - a. *Panamaca*
      - b. *Carawala*
      - c. *Tunki*
    - 3. *Boa*
    - 4. *Bawahca*
- III. *Matagalpa*
  - A. *Matagalpa*
    - 1. *Matagalpa*
      - a. *Matagalpa*
      - b. *Cacaopera*
      - c. *Chato* (?)
      - d. *Dule* (?)
      - e. *Pantasma* (?)

BIBLIOGRAPHY

W. Lehmann (1920) republishes most of the known vocabularies and other original material, and cites most of the published works. See also Thomas and Swanton (1911). Especially important, or of recent date, are the following:

Miskito.—Adam, 1891, 1892; Bell, 1862; Berckenhagen, 1894, 1905, 1906; Brinton, 1891 b; Conzemius, 1929 b, 1932; Cotheal, 1848; Fellechner, Müller, and Hesse, 1845; Heath, G. R., 1913, 1927; Henderson, A., 1846; Henderson, G., 1811, pp. 227–229; Young, T., 1842, pp. 170–172; Zidek, 1894.

Sumo.—Conzemius, 1929 b, 1932; Membreño, 1897.

Matagalpa.—Brinton, 1895 b; Sapper, 1901.

Ulua.—Squier, 1853.

COFÁN (KOFANE)

The extinct *Cofán* has heretofore been considered by all authorities an independent family, though this is unlikely in view of their small area. The language has probably long been extinct, though there are a few hundred *Cofán* still living. Both of the principal authorities on this region, Rivet and Jijón y Caamaño, are now convinced that *Cofán* is related to *Chibchan.* Rivet has not yet presented his proof or intimated his opinion as to the closeness of the connection. Jijón y Caamaño (1941–43) makes *Cofan* one of the eight members of his *Macro-Chibchan* phylum. He gives no subsidiary languages. Connections with the *Barbacoa* Group of *Chibcha* have also been suggested.

Two adjacent groups that have often been considered as *Cofán* languages are *Kijo* and *Latacunga.* These have sometimes been identified with the historical *Cara* or *Syri.* Both may be more purely *Chibchan.* The *Kijo* (*Quijo*) (q. v.) were *Quechuaized* long ago. Jijón y Caamaño (1941–43) places them in his Inter-Andine group of *Chibcha.*

Bibliography.—Castellví, 1938; Jijón y Caamaño, 1941–43.

LANGUAGES OF DOUBTFUL CHIBCHAN RELATIONSHIPS

COCHE (MOCOA)

Synonyms: *Koche, Kotše, Koče, Mocoa, Mokoa, Sebondoy, Sibundoy, Kamsá, Quillacinga, Kilasinga.*

The more important historical name *Coche* seems to have supplanted *Mocoa(n)*, which Brinton (1891 a) and Chamberlain (1913 a) gave to this supposedly independent family. *Mocoa* is retained by a few modern authorities, such as Krickeberg (1922) and Loukotka (1935). Most of them have accepted its independent position, but in his recent thorough study Jijón y Caamaño (1941–43) reached the conclusion, occasionally previously suggested, that it is *Chibchan*, influenced by *Carib*, closest to *Chibcha* Proper, to *Cágaba*, and to *Talamanca*, in this order. However, Ortíz (1941), the most recent writer, refuses to accept Jijón y Caamaño's conclusions and insists on the independence of *Coche.* He believes that the rather extensive *Chibchan* resemblances are due to borrowing. Rivet has also not yet, to my knowledge, accepted the *Chibchan* affinities or decided to remove *Coche* from his list of independent families. The language is sometimes called *Camsá;* the principal tribe is the *Sebondoy;* the related *Quillacinga* and *Mocoa* are extinct, but there are said to be some 1,700 *Sebondoy*, though probably not all speaking their native tongue. The *Mocoa* have adopted *Quechua* and are now known as *Ingano.*

Jijón y Caamaño (1941–43) does not recognize the *Coche* as a separate group or mention the name in his classification, but lists the languages *Quilla,*[11] *Quillacinga*, and *Sebondoy-Mocoa* together with the *Chibcha* Proper languages in his *Cundinamarca* subgroup of the Eastern Group. In his map II, however, he places them with the *Barbacoa* subgroup (Western Group).

The lexical data are considerable (see Ortíz, 1941; Jijón y Caamaño, 1941–43), but grammatical material is badly needed.

COCHE (MOCOA)

1. *Sebondoy.*
2. *Quillacinga.*
3. *Patoco.*

BIBLIOGRAPHY

Buchwald, 1919; Castellví, 1934 a, 1934 b; Chamberlain, 1910 a, pp. 191–192; Ernst, 1891; Igualada and Castellví, 1940; Jijón y Caamaño, 1938, 1939, 1941–43, 1:97–144; Ortíz, 1938, 1941 a; Rivet, 1912 a; Sañudo, 1923.

ESMERALDA

A tiny extinct group of the coast of Ecuador that has been considered as forming an independent family since the classification of Chamberlain (1913 a). The data upon it are very few. Pericot y García (1936) gives *Atacame* as a synonym; this can have no relation to the *Atacama* of the Chilean desert region. W. Schmidt (1926) believes that it may belong with the *Barbacoa* Group of *Chibcha*, a very probable connection, but it is unlikely that its exact affiliations will ever be proved. Jijón y Caamaño (1941–43) believes it to be distantly related to *Chibcha*, forming, with *Yaruro*, the *Paleo-Chibcha* division of his *Macro-Chibcha* phylum. (See Murra, Handbook, vol. 2, p. 802.)

Bibliography.—Buchwald, 1920, 1922; Jijón y Caamaño, 1941–43; Rivet, 1912 a; Seler, 1902 a, 1902 b.

TAIRONA AND CHIMILA

The long-extinct *Tairona* have generally been classified as *Chibchan*, doubtless because of their close geographical proximity to the *Chibchan*-speaking *Cágaba*. The same is true of the living *Chimila*, sometimes regarded as the modern descendants of the *Tairona*. Thus Park (Handbook, vol. 2, p. 868) says that the *Tairona* and *Chimila* "although linguistically related, are not included in this [i. e., *Cágaba-Arhuaco*] designation." Both of these are low-altitude peoples, coast, foothill, or lowland-dwellers, the culture of the *Chimila* being mainly that of a forest people. The language of the *Tairona* is utterly unknown; they may well have been *Cariban* or *Arawakan*.[12] Reichel-Dolmatoff has recently done work among the *Chimila*. His linguistic material has not yet been published, but he informs me (personal communication) that *Chimila* is *Arawakan*. *Arawakan* affinities of *Tairona* would not be unexpected, since they were coterminous with the *Arawakan*-speaking *Goajiro*.

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[11] Hernández de Alba (Handbook, vol. 2, p. 922) places *Quilla* in the *Páez* subgroup of the *Talamanca-Barbacoa* group, but *Quillacinga* as a member of the *Cochean* family.

Bibliography.—Bolinder, 1924, 1925; Celedón, 1886.

YURUMANGUÍ

This hitherto neglected and almost unknown group and language of the Colombian west coast has recently assumed considerable importance. A manuscript vocabulary was recently discovered in the Archivo Nacional in Bogotá and published. Dr. Paul Rivet has been studying it for some years, finds no resemblances with any nearby language, and believes it to be *Hokan* and therefore related to Melaneso-Polynesian (Rivet, 1943). Ortíz (1946) does not consider the point as proved, and prefers to consider *Yurumanguí* as an independent tongue.

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Archivo nacional . . ., n. d.; Arcila Robledo, 1940; Jijón y Caamaño, 1941–43, vol. 3, appendix 2; Ortíz, 1946; Rivet, 1943.

TIMOTE

This small group of the Venezuelan highlands has been much more thoroughly investigated than most, but unfortunately the linguistic data are still limited to a few small vocabularies. No running text or grammatical study is known, and one is urgently needed. Rivet (1927 a) has assembled all the information available. Regarding the opinion of Ernst (1885) that *Timote* is related to *Chibcha*, Rivet reaches the same conclusion that Brinton (1891 a) did earlier, that there is some lexical resemblance, but not enough for proof, and that *Timote* had best be considered independent. In this all other authorities agree with him, except Jijón y Caamaño (1941–43), who believes in the relationship and makes *Timote* Group C of his *Macro-Chibcha* phylum.

Muku is a synonym for the family. There seem to be two main languages, *Timote* and *Cuica* (*Kuika*). With *Timote* are probably related *Mirripú* (*Maripú*), *Mukuchí* (*Mocochí*), *Migurí*, *Tiguiñó*, and *Escaguey;* with *Cuica*, *Tostó*, *Escuque*, and *Jajó*. However, Brinton (1891 a) lists 29 groups, the names taken from Ernst (1885), and

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[12] I wish here to make public confession and express regret that I identified the Santa Marta archeological culture with the *Tairona*. In this Handbook (see vol. 2, p. xxix) the Santa Marta archeological culture is considered as one of the few that have been tied up with an historic people. This identification has not yet been proved, but seems probable. A careful study of the original historical sources, a thing I have not yet found time to do, will be the major factor in determining the question.—J. A. M.

Rivet (1927 a), making a more thorough study, compiles a list of names, synonyms, and variations of 99 dialects and 29 varieties, each probably linguistically distinguishable. This is one example of the tremendous complexity of language in South America.

Timote Family (Venezuela)[1]

- I. *Cuica* (*Kuika*)
    - A. *Cuica* Proper
    - B. *Tostó*
        - 1. *Tostó* Proper
        - 2. *Tiranjá*
        - 3. *Tomoní*
    - C. *Eskuke* (*Eskukey*)
        - 1. *Eskuke* Proper
        - 2. *Bombá*
        - 3. *Moka*
        - 4. *Tirandá*
            - a. *Čobú*
            - b. *Čačike*
            - c. *Čaču*
            - d. *Tirandá* Proper
            - e. *Estiguate* (*Estiguati*)
    - D. *Jajó* (*Jakón*, *Jajón*)
        - 1. *Jajó* Proper
        - 2. *Esnijaque*
        - 3. *Kikoke* (*Kikoki*)
        - 4. *Mapen* (*La Vega*)
        - 5. *Duri*
        - 6. *Mikimboy*
- II. *Timote* (*Timoti*)
    - A. *Timote* Proper
        - 1. *Mukurujún*
        - 2. *Mukusé*
        - 3. *Mokoyupu*
        - 4. *Mukuarsé*
        - 5. *Ciribuy*
        - 6. *Miyoy*
        - 7. *Mukumbá*
        - 8. *Kindorá*
        - 9. *Tafallé*
        - 10. *Mukumbají*
        - 11. *Čino*

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[1] From Rivet, 1927 a, 4:137–167. In this article, which includes a large map and bibliography, the *Timote* Family is divided into two groups: *Timote* Proper and *Cuika*. The *Cuika* he divides into the four groups above noted.

The *Timote* group is divided into numerous subgroups, of which the only one he names is the *Timote* Proper. The five groups above: *Timote* Proper, *Chama*, *Mocochi*, *Mucutu*, and *Tapano* are distinguished on basis of Rivet's grouping in text into five paragraphs of very different lengths. Names are mine, choosing a name in this group shown on his map, except *Chama*, which is accepted generic.

Loukotka (1935) makes a fourfold division: (1) *Timote;* (2) *Mokoči;* (3) *Migurí;* (4) *Cuika.* His (2) and (3) are included in Rivet's *Timote* group. *Migurí* is probably equivalent to *Chama.*

Timote Family (Venezuela)[1]—Continued

II. *Timote* (*Timoti*)—Continued
  B. *Čama* (*Miguri ?*)
    1. *Mokunče* (*Mukunče, Mukuneče*)
    2. *Mukurubá* (*Mokuruguá*)
    3. *Tabay* (*Mukunutáne, Tabayon ?*)
    4. *Mukurumagua*
    5. *Guake* (*Guakí*)
    6. *Mukumba*
    7. *Čičuy*
    8. *Mukuñoke* (*Mukuño, Migurí ?*)
      a. *Mukurufuén*
      b. *Muká*
      c. *Mukumpí*
      d. *Mukutirí*
      e. *Mukusnandá*
      f. *Mukaikuy*
      g. *Mukusó*, etc.
    9. *Mukurandá*
    10. *Mukuhúun* (*Mukupine, Mokoion*)
    11. *Čiguará*
    12. *Insnumbí* (*Insumbi*)
    13. *Estankes*
    14. *Mukuči* (*Makuči, Mokočiz*)
      a. *Misantá*
      b. *Mokao*
      c. *Mosnačó*
      d. *Misikea*, etc.
    15. *Eskagüey*
    16. *Mukujún*
    17. *Tatuy* (*Tatey ?*)
    18. *Mukaria*
    19. *Mukaketá*
    20. *Mukusirí*
    21. *Kaparú*
    22. *Jají* (*Mukundú*)
    23. *Mukubače* (*Mirripú, Mirripuy, Maripú ?*)
    24. *Mukúun* (*Mukumpú, Lagunillas*)
      a. *Kasés*
      b. *Mukuinamo*
      c. *Arikagua*
      d. *Tibikuay*
      e. *Makulare*
      f. *Mukusumpú*
      g. *Barbudos*
      h. *Jamuén*, etc.
      i. *Kinaró*
      j. *Tiguiñó*
    25. *Guaruní* (*Guarurí*)

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[1] For footnote 1, see page 189.

TIMOTE FAMILY (VENEZUELA)[1]—Continued

- II. *Timote* (*Timoti*)—Continued
  - C. *Mocochí* (*Mokoči*)
    - 1. *Miyuse*
    - 2. *Tukaní*
    - 3. *Mokoči* (*Torondoy*)
  - D. *Mukutu* (*Escaguey*)
    - 1. *Eskaguey*
    - 2. *Kanaguá*
    - 3. *Kinó*
    - 4. *Mokoino* (*Mokino*)
    - 5. *Mombun*
    - 6. *Yarikagua*
    - 7. *Arikagua*
    - 8. *Mukutuy*
    - 9. *Mukupatí*
    - 10. *Mukučači*
    - 11. *Trikagua*
    - 12. *Mokoto* (*Mukutu*, *Mukutí*)
      - a. *Guarake*
      - b. *Bailadores*
  - E. *Tapano*
    - 1. *Aviamo*
    - 2. *Mokombó* (*Mokobo*)
    - 3. *Tapano*
- III. Unclassified tribes
  - A. *Kirorá*
  - B. *Mijure*
  - C. *Montun*
  - D. *Iguino*

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[1] For footnote 1, see page 189.

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Briceño-Iragorry, 1929; Brinton, 1892 a; Chamberlain, 1910 a; Ernst, 1885; Fonseca, 1914 (1920); Jahn, 1927; Márcano, 1891; Oramas, 1920; Rivet, 1927 a; Tavera-Acosta, 1907.

CANDOSHI, CHIRINO, AND MURATO

Each of these extinct or little-known languages of western Ecuador has been linked by some recent authority with some other, or others. Rivet (1924 a) considered *Chirino* as forming an independent family. Loukotka (1935) calls the family *Candoshi* (*Kandoši*), and composes it of two groups, one consisting of the *Candoshi* and *Shapra*, the other of the extinct *Chirino* (*Cumbaraja*), *Sacata*, and *Rabona*. He considers *Murato* a synonym of *Candoshi*. Tessmann (1930) makes *Shapra* and *Murato* divisions of *Candoshi*, which language, synonymous with *Maina* in his opinion, he considers a mixture of *Ge*, *Arawak*, and *Pano*. Rivet thinks that *Chinchipe* is a synonym of *Murato*, and Steward and Métraux (Handbook, vol. 3, p. 615) believe that

Chinchipe and *Bagua* are probably related to *Patagón*. Brinton (1891 a) long ago placed *Murato* with *Záparo*, and Steward and Métraux (Handbook, vol. 3, pp. 629, 633) call it a subtribe of *Zaparoan Andoa*.

Jijón y Caamaño (1941–43) regards this group, "Lenguas Muratas," as related to *Chibcha*, composing Group E of his *Macro-Chibcha* phylum.

Bibliography.—Anonymous, 1897; León, A. M., 1928–29; Rivet, 1930 b; Tessmann, 1930.

CHOLÓN

Synonyms: *Cholona, Tšolona, Čolón, Tscholón.*

Cholón (*an*) is one of the small families early distinguished (Chamberlain, 1913 a) and universally accepted. According to the majority of authorities, it consists of two languages, the *Cholona* Proper or *Tinganes* and the *Híbito* (*Xibito, Chibito*, etc.). Brinton (1891 a) quotes early sources to the effect that the *Cholón* spoke a different language from the *Híbito*. Tessmann (1930) calls it a language mixed with *Quechua;* he gives a vocabulary of 30 words. Jijón y Caamaño (1941–43) makes *Cholona* the last (H) component member of his *Macro-Chibchan* phylum.

A grammar has been recently published by Fr. Pedro de la Mata (1923); an earlier work on *Cholón* by Fr. Francisco Gutierrez is mentioned. J. P. Harrington has recently compared *Cholón* with *Quechua* and believes them related. His evidence has not been published.

Bibliography.—Beuchat and Rivet, 1909; Brinton, 1892 a; Chamberlain, 1910 a; Mata, 1923; Tessmann, 1930.

HÍBITO

The extinct *Híbito* (*Chíbito, Xíbito, Jíbito, Zíbito, Íbito*, etc.) is classed with *Cholón* (*a*) by most authorities. Brinton (1891 a) quotes the old sources to the effect that the *Cholón* spoke a different idiom from the *Híbito*. Tessmann (1930)[13] calls it a mixed language (*Pano-Ge*), while *Cholón* he considers mixed with *Quechua*. He gives a 33-word vocabulary. Loukotka (1935) also believes it mixed with *Panoan*. It became extinct about 1825. A grammar was written by Fr. José de Araujo.

Bibliography.—Izaguirre, 1927–29; Tessmann, 1930.

COPALLÉN

Apparently only four words are known of the extinct *Copallén*, of Copallén, Llanque, Ecuador. Jijón y Caamaño (1941–43), who has made a most thorough study of the languages of western Ecuador, dismisses it with a word, but accords it independent position in his final classification (1943). The data on which Loukotka (1935) assigns it to an independent family must, therefore, be very slight; it had better be left unclassified. It seems to be ignored by all other authorities.

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[13] Pages 458–459. This was unfortunately omitted from his Table of Contents.

Bibliography.—Jijón y Caamaño, 1941–43.

ACONIPA (AKONIPA)

Aconipa is one of the almost unknown languages considered as an independent family by Loukotka (1935) and apparently mentioned by no other compiler. In his recent exhaustive study of pre-Columbian western Ecuador, Jijón y Caamaño (1941–43) merely mentions it as one of the languages of Ecuador; he leaves it independent in his final (1943) classification. Extinct, the data on it are very few, and insufficient to warrant its classification, at any rate as a distinct family.

Bibliography.—Jiménez de la Espada, 1897, p. 32.

YUNCA-PURUHÁN

If the validity of the group of languages under consideration were established, "*Yuncahá*" would be proposed as a cogent hybrid term. The classification of the extinct coastal languages of Ecuador and northern Perú has always been—and may always be—uncertain and controversial. The "family" consists of the five groups that were given independent status by Rivet (1924 a) under the names *Atalán*, *Cañari*, *Puruhá*, *Sek*, and *Yunka*. *Yunca* and *Cañari* are families of long standing, at least since the classification of Chamberlain (1913 a); *Sek* is proposed by Rivet alone (1924 a). Jijón y Caamaño (1941–43) comes to the conclusion, as a result of his exhaustive studies of pre-Columbian western Ecuador, that *Puruhá*, *Canyari*, and *Manteña* (*Manabita*) are closely related and go with *Yunga* to form an independent family. He claims that all these differ hardly more than dialectically. As all these "families" and their component languages are extinct with practically no lexical data, except for *Yunca*, and as Jijón y Caamaño reaches these conclusions mainly on the basis of proper names, the degree of relationship will probably never be proved. The family also includes, in his opinion, *Huancavilca*, by which he apparently implies Rivet's *Atalán* family. He proposes the name *Puruhá-Mochica* for this family, which he considers a major division (G) of his *Macro-Chibcha* phylum.

Jijón y Caamaño is by no means the first or only one to propose such a consolidation. W. Schmidt's (1926) *Yunca-Huancavilca* Group consists of *Huancavilca* (*Atalán*), *Tallan* and *Sechura* (*Sec*), and *Yunca*, *Mochica-Chanco*, *Chimu*, and *Eten* (*Yunca*); he does not mention *Puruhá* or *Cañari*. Loukotka (1935) establishes a *Chimu* family with a *Yuncan* southern division, and a *Puruhá-Cañari* northern division.

YUNCA

Synonyms: *Yunga, Mochica, Chimu.*

The *Yunca, Mochica,* or *Chimu* language of the Northern Coast of Perú is fairly well known through De la Carrera's grammar (1644). It is practically extinct, but a few words are said still to be used by some of the Coast fishermen. A relationship to *Chibcha* (*Barbacoa, Colorado*) has been suspected, but W. Lehmann (1920) compared *Mochica* with *Colorado* without any result. Uhle has suggested a relationship with *Uro* (q. v.). Chamberlain (1913 a) and Brinton (1891 a) both posited a *Yunca(n)* family.

The former extent of the *Yunca* languages to the south and inland is much disputed. Some authorities believe it extended south to Ica, including practically the entire Perú Coast. According to Jijón y Caamaño (1941–43), it reached to south of Lima. He also believes that it included the North Perú Highlands, including the provinces of Cajamarca and Ancachs, a region ordinarily ascribed to *Quechua*, and impinged on the *Híbito* and *Cholona* of the Montaña to the east. These deductions are drawn from study of place names and traditions, since these regions were *Quechuaized* in very early, probably pre-Conquest, days.

The following regions or ethnic groups are thus of uncertain original language and are left unclassified on the linguistic map: *Ayavaca, Huancapampa, Huambo, Chachapoya, Cajamarca, Huamachuco, Conchuco, Huacrachuco, Huayla, Pinco, Ocro, Huamalí, Huanuco, Cajatampo, Atavillo, Chinchaycocha, Tarma,* and *Yauyo.*

Dr. J. P. Harrington, after a study of De la Carrera's grammar (personal communication), reports that the phonetics are almost identical with *Quechua*, and that there are many vocables and other features like *Quechua*. Most nouns, and also most verbs, are monosyllabic, generally ending in a vowel. The morphological mechanism is generally by suffixes.

Less acceptable is the opinion of Zeballos Quiñones that the place names of the region show *Maya* and *Zapotec* resemblances, and present proof of Central American influences in the *Chimu* region.

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PURUHÁ

A small group, established as an independent family by Rivet (1924 a) and accepted as such by a few others. It became extinct about the close of the 17th century. There is general agreement that it is related to *Cañari.* (See Murra, Handbook, vol. 2, p. 797.)

Bibliography.—Jijón y Caamaño, 1923–24, 1941–43, 1: 410–455, 3: 88–136.

CAÑARI (CANYARI)

Also a small group, but one of longer standing as an independent family, since at least the time of Chamberlain (1913 a). No linguistic subdivisions have been suggested. (See Murra, Handbook, vol. 2, p. 799.)

Bibliography.—Chamberlain, 1910 a; Cordero Palacios, 1924; Jijón y Caamaño, 1921, 1941–43, 2: 3–78, 3:5–140; Moreno-Mora, 1922; Rivet, 1912 a.

ATALÁN

Apparently *Atalán* and *Tallán* must be distinguished, although the languages are adjacent in coastal Ecuador. Confusion and disagreement are great. The linguistic data on both are so slight that their true affiliations will probably never be certainly known. *Atalán* was first proposed as an independent family by Rivet (1924 a), consisting of the languages *Manta, Huancavilca, Puna,* and *Tumbez.* It is one of four language groups that Loukotka (1935), with unusual reticence, left unclassified. Jijón y Caamaño (1941–43) after thorough study placed the group with his *Puruhá-Mochica* group of *Macro-Chibchan,* a classification provisionally accepted herein. It is uncertain whether the *Caraca* group goes with the *Atalán Manta* or with the *Barbacoan Cara.* Dialects of *Atalán* seem to be *Apichiquí, Cancebí, Charapoto, Pichote, Pichoasac, Pichunsi, Manabí, Jarahusa,* and *Jipijapa.*

Bibliography.—Jijón y Caamaño, 1941–43.

YUNCA-PURUHÁ

I. *Yunca-Puruhá* (*Yunca-Wancavilca, Puruhá-Mochica*)
    A. *Yuncan*
        1. North Group (*Puruhá-Cañari*)
            a. *Puruhá*
            b. *Canyari* (*Cañari*)
            c. *Manabita* (*Mantenya*)
        2. South Group (*Yunca*)
            a. *Yunga*
            b. *Morropé*
            c. *Eten* (?)
            d. *Chimu*
            e. *Mochica* (*Chincha*)
            f. *Chanco*

YUNCA-PURUHÁ—Continued

I. *Yunca-Puruhá* (*Yunca-Wancavilca, Puruhá-Mochica*)—Continued
  B. *Atalán*
    1. *Wancavilca*(*Huancavilca*)[1]
      a. *Manta*[2]
      b. *Tumbez*[3]
      c. *Puna*[1]
      d. *Carake: Apichiki, Cancebi*

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[1] See Murra, Handbook, vol. 2, p. 806.

[2] See Murra, Handbook, vol. 2, p. 803.

[3] See Murra, Handbook, vol. 2, p. 807.

SEC, SECHURA, OR TALLAN

The small *Sec* "family" of restricted area in westernmost Ecuador was first proposed by Rivet (1924 a). Loukotka (1935) accepts the proposed family and calls it *Sechura* (*Sečura*). W. Schmidt (1926) puts it in his *Yunca-Huancavilca* group, together with several others of Rivet's "independent" families in this region. Brinton (1891 a) also grouped it with *Yunca*. Jijón y Caamaño (1941–43) who, in his very complete study of pre-Columbian western Ecuador, accepts the *Yunca-Huancavilca* group under his proposed alternative name *Puruhá-Mochica*, passes *Sec* off with the brief note that it was a language of Tallana, Ecuador, extinct in the last century, implying that not enough is known of it to classify it with any degree of finality; this is probably true at present. In his final classification (1941–43), Jijón y Caamaño makes *Tallán* a separate phylum.

The extinct languages *Tallán*, *Chira* (*Lachira*), *Colan*, *Piura*, and *Sechura* are generally classed with *Sec*. The *Catacao*, a little further inland, are said still to speak their presumably related language; their investigation is a great desideratum. There is an *ipso facto* presumption of connection between *Tallán* and the extinct *Atalán* "family" just to the north, but the differentiation must be kept in mind. The linguistic data seem to be limited to 40 words collected by Spruce and published in Markham (1864 a).

Bibliography.—Markham, 1864 a.

KECHUMARAN

"*Kechumaran*" is a hybrid term here proposed for the first time to designate the yet unproved but highly probable subphylum consisting of *Quechua* and *Aymara*. It has long been believed that *Aymara* and *Quechua* have linguistic as well as cultural relations. The extent of this relationship still awaits study. Phonetics and morphology show a relatively common pattern and many close similarities, but the lexical roots seem to have little in common except a large number, possibly as much as a quarter of the whole, obviously related and probably borrowed by one or the other language. They have been in close contact for probably several thousand years. *Aymara* is generally termed the "older" language, that is, that of wider extent in pre-*Inca* days, and one that has yielded ground to the *Quechua*. The two will probably eventually be found to be members of a large phylum; the *Hokan*-like traits that have been claimed for *Quechua* probably apply also to *Aymara*.

Jijón y Caamaño (1941–43) presents cogent arguments for his adoption of a *Quechua-Aymara* phylum. Both may possibly be members of *Hokan-Siouan*, one of the great phyla of North America; J. P. Harrington (1943) is convinced of the connection. This would not be entirely unexpected since scattered *Hokan* enclaves are found as far south as Nicaragua (*Subtiaba*), and Rivet has considered the possibility that *Yurumanguí* (q. v.) may also be *Hokan*.

QUECHUA

Quechua (*Kechua*, *Quichua*, *Keshwa*, etc.) is the South American analogue of *Aztec*. That is, it was the language of a relatively small group, the so-called *Inca*, who established a great military empire, conquered surrounding peoples, and to some extent imposed their language upon the latter. In Colonial days it became a lingua franca over an even wider area, displacing still other aboriginal languages, and this process has continued until the present. Today probably several millions of Indians in Perú, southwestern Ecuador, western Bolivia, and northwestern Argentina speak *Quechua*, and most of them nothing else. As many Peruvians speak *Quechua* as Spanish. Practically the entire population of the provinces of Cuzco and Ayacucho can speak *Quechua*. Of course, it is slowly losing ground to Spanish.

Quechua probably occupied a comparatively small area in the upper Apurimac and Urubamba drainage until the era of the great *Inca* conquests under Pachacuti about 1450; it was then merely one of many possibly unrelated languages in the Andean region. It overwhelmed and supplanted many of these other languages, which probably survived in local use until after the Spanish Conquest and then became extinct during the Colonial Period. (Personal letter from John Rowe; see also Handbook, vol. 2, pp. 183–470.)

In 1530, although *Inca* military sway extended from Ecuador to Chile and Argentina, the native languages had not yet been replaced by *Quechua*, which apparently occupied only a small region in the Cuzco region, represented by the groups *Cavina*, *Cuzco*, *Chilque*, *Lare*, *Quechua*, *Paucartampo*, *Vilcapampa*, and *Yanahuara* (see Handbook, vol. 2, map 3, facing p. 185). In a few years, however, *Quechua* replaced the native languages throughout the northern highlands to Ecuador and even to southern Colombia, those of the central and southern coasts, and those of a considerable part of the highlands to the south. Jijón y Caamaño (1941–43) believes and presents some evidence that the former languages of the northern highlands and the coast were related to *Yunca* (q. v.). The *Quechua* dialects that replaced these are known as *Chinchaisuyo*, the autochthonous dialects of the Cuzco region as *Tahuantisuyo*. The *Huanca* seem to have been a group apart. To the south, *Quechua* replaced many *Aymara* groups. The extension of *Quechua* to the central coast was apparently a rather early one and many authorities accord it some littoral in earliest days.

The following regions or groups in the Peruvian highlands speak or spoke (at least in part) *Quechua* at some post-Conquest period but were presumably originally of other linguistic affiliations, possibly many of them *Yunga*, and are, therefore, left unclassified on the linguistic map: *Calva*, *Ayavaca*, *Huancapampa*, *Huambo*, *Chachapoya*, *Cajamarca*, *Huamachuco*, *Conchuco*, *Huacrachuco*, *Huayla*, *Pinco*, *Huamalí*, *Ocro*, *Huanuco*, *Cajatampo*, *Chinchaycocha*, *Atavillo*, *Tarma*, *Yauyo*, *Huanco*, *Angará*, *Chocorvo*, *Choclococha*, *Vilcas*, *Rucana*, *Chanca*, *Sora*, *Parinacocha*, *Aymara* (distinguish from *Aymara* family), *Contisuyo*, *Omasuyo* (distinguish from *Aymara Omasuyo*), *Cotapampa*, *Cavana*, *Chumpivilca*, and *Arequipa;* also *Cochapampa* and *Yampara* to the east, and *Chicha* and *Lipe* to the south.

The *Quechua* languages do not differ greatly, and none varies much from the norm—additional evidence of the relatively recent spread. There are a great number of dialects, probably a slightly variant one for each of the many *Quechua*-speaking villages, and these form regional groups, but probably none is absolutely unintelligible to any other. That of Cuzco was and is the standard. Those of the Ayacucho group are the most diversified, individualized, and in some respects most archaic.

The list of *Quechua*-speaking tribes and groups depends greatly on the temporal period; ever since about 1450, Indian groups on the peripheries of the *Quechua* region in Ecuador, Perú, Bolivia, and Argentina have been abandoning their native languages in favor of *Quechua*. This presumably produces somewhat mixed languages but not true dialects. Among these *Quechuaized* groups the most prominent are the *Cara* or *Quito* (*Kito*) of Ecuador, the *Chícha* and *Lipe* of Bolivia, the *Allentiac*, the *Sanavirón*, and the *Vilela-Chulupi* of Argentina. (See also Handbook, vol. 2, map 3.)

The *Quechua* dialects are known only by the names of the villages where they are spoken; the groups of dialects, by the names of the provinces in which they center.

MODERN QUECHUA CLASSIFICATION

I. Northern (*Chinchaysuyu*)
    A. Ayacucho
    B. Junín
    C. Huánuco
    D. Ancash
    E. Huamachuco (*Cajamarca*)
    F. Chachapoya
II. Southern (*Tahuantisuyo*)
    A. Cuzco
    B. Puno
III. Coastal
    A. Arequipa

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Like that of *Aztec*, the bibliography of *Quechua* is very large, both early and recent. The best grammar seems to be that of Middendorf (1890).

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AYMARA

Aymara is one of the great living languages of South America; there may be half a million speakers in Bolivia and Perú. A number of *Aymara* "dialects" are distinguished. The differentiation of the modern ones is apparently not great, and none seems to vary greatly from the norm. Those most different are around Lake Titicaca. No suggestions have been made of the grouping of these dialects into major divisions. The most important ones are apparently *Collao* and *Lupaca*.

The *Aymara* region was certainly originally larger than at present, and probably many *Aymara* dialects in addition to the few recorded have been replaced by *Quechua*. In many towns *Aymara* and *Quechua* are both spoken, and occasionally *Aymara* enclaves have been left in a present-day *Quechua*-speaking region. Similarly *Uro* groups are surrounded by *Aymara*. Apparently, however, *Aymara* was always limited to the Highlands of Bolivia and Perú, and its former extension to the Pacific seaboard in the Tacna-Arica-Arequipa region is no longer credited, nor the *Aymara* affinities of the *Cauki* (*Cauqui*, *Huarochiri*) group in the neighborhood of Lima, Perú.

Aymara is spoken today by the historic subtribes *Colla*, *Collagua*, *Cana*, *Canchi*, *Ubina*, and parts of the *Charca* and *Collahuaya* (Handbook, vol. 2, p. 503). The *Caranga*, *Lupaca*, *Quillaca*, *Omasuyo*, *Pacasa*, *Paria*, and *Sicasica* have given it up in favor of *Quechua* or Spanish. It was also spoken, together with *Quechua*, in Sora, Chanca, Arequipa, Chicha, Lipe, Chumpivilca, and Vilcas.

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CHIQUITOAN

The *Chiquito* (*Chikito*) form a solid small group in southeastern Bolivia. This Spanish word, meaning "very small," has always been applied to the family; *Tarapecosi* may be a synonym. It has been accepted as independent since earliest writers, but not unlikely may later be found to tie with other groups into a major phylum. Lafone-Quevedo (1910) notes many resemblances to *Guaycurú* (q. v.) and believes them related, *Mbayá* being the closest of the *Guaycurú* languages to *Chiquito* both geographically and pronominally. He notes resemblances also with many other important families: *Quechua*, *Mataco*, *Macá*, *Araucanian*, *Tupí-Guaraní*, *Arawak*, and *Carib*, and apparently believes that all these and others are related. As his deductions are based mainly on resemblances in the pronominal systems they cannot be accepted as more than suggestions at present. A connection with *Bororo* has also been suggested.

Hervás y Panduro (1800) gives the names of some 35 *Chiquito* bands divided into 4 dialects; most of these are presumably extinct. (See Métraux, Handbook, vol. 3, p. 383.) Modern writers mention up to seven groups in two main divisions. There is general agreement regarding the modern divisions. Loukotka (1935) and Jijón y Caamaño (1941–43) place the *Sansimoniano*, generally regarded as *Carib*, with *Chiquito;* Rivet calls it *Chapacuran*. Of the extinct *Manacica*, Métraux (Handbook, vol. 3, p. 388) says that Lucas Caballero (1933) identifies them with *Tapacura* and *Quitemoca*, which, if true, would make them *Chapacuran*.

CHIQUITO

I. North: *Chiquito*
    A. *Manasí* (*Manacica*)
    B. *Penoki* (*Penokikia*)
    C. *Pinyoca:*
        1. *Kusikia*[1]
    D. *Tao:*
        1. *Tabiica*[2]
II. South: *Churapa*

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[1] Métraux (Handbook, vol. 3, p. 383) says that D'Orbigny (1839) reported that the *Kusikia* dialects were full of foreign words, mainly *Arawakan Paiconeca*.

[2] Possibly the same as the *Tapii*, who also may have spoken either *Zamucan* or *Otukean*.

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MACRO-GUAICURUAN

Macro-Guaicurú is a name here proposed for the first time for a phylum that includes several families, heretofore considered independent, in the general region of the Gran Chaco. As at present constituted it consists of *Mataco*, *Macá* (*Enimagá*, *Cochaboth*) (see *Mataco-Macá*), and *Guaicurú*. The latter, probably the most important of the three, has been taken as the basis for the name. Doubtless other families in this region, at present regarded as independent, will eventually be joined to it; one of the first may be *Chiquito* (Lafone-Quevedo, 1910); *Lule-Vilela* is a possibility. Evidence for the connections will be given in the family articles. That for *Mataco-Macá* is mainly lexical; that for *Guaicurú* (and *Chiquito*) morphological. The morphologies have a *Hokan*-like aspect.

MATACO-MACÁ

Matako-Maká was first suggested as a name for the combined *Mataco-Mataguayo* and *Enimagá* (*Cochaboth, Makká*) "families" by Métraux (1942 b). No thorough linguistic proof of this connection has yet been presented, but it is herein accepted as probable, though not as certain or proved.

A comparison of *Vejoz* and *Towothli* vocabularies shows a large number of correspondencies, many of them practically identical, but not a large proportion of the entire vocabularies. The possibility of extensive borrowing cannot be discounted, but the resemblances are mainly in common and fundamental words. No sound-shifts were noted with enough examples to warrant any suggestion of rules, but a number of cases of *Vejoz j* to *Towothli k*, *ch* to *k*, *s* to *ts*, *e* to *ai*, *e* to *i*, *u* to *o* were noted. At the same time vocabularies of *Suhin-Chunupí* and *Chorotí* were compared. These seem to be about equidistant from *Vejoz* (*Mataco*) and from *Towothli* (*Macá*), a little closer, as would be expected, to *Vejoz*.

MATACO

This family has always been accepted as independent under the name *Mataco* or *Mataco-Mataguayo*. It is herein considered a member of the *Macro-Guaicurú* (q. v.) phylum, which includes also *Macá* (q. v.; also *Mataco-Macá*) and *Guaicurú*. The evidence of the relationship of *Mataco* and *Guaicurú* is outlined by Henry (1939), who stated that the grammatical structures of *Ashluslay* and *Pilagá* are so similar that an ancient historical relationship should be posited. He decided, however, not to place *Ashluslay* in the *Guaicurú* stock since the lexical difference is so great. There seem to be no doubts of the *Mataco* affinities of *Ashluslay*. Suggestions of relationships between *Mataco* and *Guaicurú* had previously been made by D'Orbigny (1839), Lafone-Quevedo (1893), Hunt (1913 a), and W. B. Grubb (1913), but had not met with general acceptance.

Several *Mataco* languages are still spoken by considerable numbers of Indians in the Gran Chaco; others are extinct.

Mataco is considered by some [14] the oldest linguistic family in the Chaco, and as having had great influence on "newer" groups. Lafone-Quevedo thought it a very mixed language, with grammar from one stock and lexicon from another.

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[14] Brinton, 1891 a; Hunt, 1915 b.

There is no great disagreement regarding the component languages of the family. All the *Mataguayo* are now known as *Vejoz*. The northwest *Mataco* were called *Nocten* in the 18th century. The Pilcomayo *Mataco* are known as *Guisnay* today. Probably each of the bands mentioned by Lozano (1941, p. 81) had a slightly divergent and characteristic dialect; their names are not repeated here. The *Ashluslay* have many synonyms, some of which must be distinguished from similar names of other groups; one, *Chunupí* or *Choropí* may be confused with the *Lule-Vilela Chunupí;* they are also incorrectly given the *Tupí* name *Tapieté.*

Loukotka (1935) puts the extinct *Guentuse* with *Mataco;* most authorities place them with *Macá* (*Enimagá*). W. Schmidt (1926) includes the extinct *Matará* (*Amulalá*) (q. v.) and *Malbalá;* Rivet (1924 a) agrees as to the latter, but *Matará* he considers *Lule-Vilela;* Métraux (Handbook, vol. 1, pp. 231–232) and Nimuendajú (map and index) think it best to consider both of uncertain affiliation. The *Matará* were related to and understood *Tonocote* (q. v.), which also W. Schmidt (1926) and Nimuendajú (map and index) place with *Mataco*. Brinton (1891 a) adds *Akssek*, a group nowhere else mentioned.

MACÁ (ENIMAGÁ, COCHABOTH)

Macá is herein postulated as a member of the *Mataco-Macá* family of the *Macro-Guaicurú* phylum (q. v.). The history of the stock and of its nomenclature is most confusing. It was first called *Guaná*, causing confusion with *Arawak Guaná*. Later it was termed *Ennimá* or *Enimagá*, but most of the languages included therein differed greatly from *Enimagá* proper. Rivet (1924 a) split these off to form his *Mascoi* family, retaining the name *Enimagá* for the present group. Probably to avoid this confusion, W. Schmidt (1926) adopted the term *Cochabot*, the *Enimagá* self-name, which is preferred also by Métraux herein; most of the others stick to *Enimagá*. Of recent years the name *Macá* or *Makká* has had some vogue. Max Schmidt (1936 a) demonstrated that the modern *Macá* or *Towothli* speak a language related to the old *Enimagá* and are probably the descendants of the latter (*Enimagá-Macá*). Nimuendajú (map and index), however, although admitting an *Enimagá* family, puts *Macá* with *Mataco*, *Toosle* (*Towothli*) with *Enimagá*. Much of the confusion is due to the *Lengua*, a name applied to several different groups. The "old" *Lengua* are *Cochaboth;* the "new," *Lengua Mascoi*. (See fuller discussion in Métraux, Handbook, vol. 1, pp. 236–237.)

MATACO-MACA

- I. *Mataco*
  - A. *Mataco-Mataguayo*
    - 1. *Mataco*
      - a. *Guisnay*
      - b. *Nocten* (*Octenai*)
    - 2. *Mataguayo*
      - a. Northern: *Hueshuo, Pesatupe, Abucheta*
      - b. Southern: *Vejoz*
  - B. *Choroti-Ashluslay*
    - 1. *Choroti* (*Yofuaha*)
    - 2. *Ashluslay* (*Chulupi, Chonopi, Suhin, Sotiagay, Tapieté*)
- II. *Macá* (*Enimagá, Cochaboth, Guaná, Lengua*)
  - A. *Enimagá*
    - 1. *Macá* (*Towothli, Toosle*)
  - B. *Guentusé*
  - C. *Cochaboth-Lengua*

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Mataco.—Anonymous, 1919 b (*Vejoz*), 1930 c, 1931, 1933 b, 1933 c (*Vejoz*); Brinton, 1898 a; Cardus, 1886, pp. 390–391; Grubb, W. B., 1913; Hunt, 1913 a, 1913 b (*Veroz*), 1937, 1940; Huonder, 1902; Kersten, 1905; Lafone-Quevedo, 1893, 1895 b (*Nocten*), 1896 a, 1896 b (*Vejoz*), 1910; Lehmann-Nitsche, 1926; Métraux, 1942 b; Nusser-Asport, 1897; Orbigny, 1839; 1896 (*Vejoz*); Pelleschi, 1881, pp. 359–423, 1896; Remedi, 1896, 1904; Schmidt, M, 1937 a (*Guisnay*); Schuller, 1906.

Chorotí-Ashluslay.—Henry, 1939; Hunt, 1915 a; Karsten, 1932, pp. 225–230; Lehmann-Nitsche, 1910–11, 1936–37; Nordenskiöld, 1912, pp. 28–31; Pape, 1935; Rosen, 1904, p. 13.

Macá.—Belaieff, 1931–34, 1940; Brinton, 1898 a (*Enimagá*); Hunt, 1915 b (*Towothli*); Huonder, 1902 (*Enimagá*); Kersten, 1905 (*Lengua, Enimagá, Guentuse*); Koch-Grünberg, 1902 b (*Enimagá*); Kysela, 1931; Métraux, 1942 b; Schmidt, M., 1936 a, 1937 b.

GUAICURÚ (WAICURÚ)

Guaicurú was an important linguistic family of the Chaco region, but most of the languages are now extinct, and the surviving groups reduced to three or four with relatively few speakers.

The family has always been accepted as independent, though several arguments for wider relationships have been made. When more careful linguistic studies are made it is not unlikely that *Guaicurú* and *Mataco* will fall together into a larger phylum to which *Chiquito* may also be added. This is the opinion of Lafone-Quevedo (1910), who considers *Mataco* a subgroup of *Guaicurú*, and both related to *Chiquito;* he also believes *Quechua* related to *Guaicurú*. All these languages have a superficial *Hokan*-like aspect which is not borne out by a hasty comparison of vocabularies; phonetics, morphology, and pronominal systems are somewhat similar.[15]

Guaicurú, of course, must be distinguished from the Baja California language of identical or similar name. The languages fall into two, possibly into three, main groups. There is little disagreement among the various authorities regarding the relationships, and the adjoined table, compiled from these, varies little from any. Names of small groups or bands, ignored here, may be found elsewhere (Lozano, 1941, p. 62). The affinities between the various "dialects" are said to be very close.

Possible or doubtful members of the family are:

Guachi.—Traditionally included but of doubtful affiliation. They may originally have had their own language, later abandoned for *Mbayá*. Loukotka (1935) considers it a language mixed with *Chiquito*. Omitted by W. Schmidt (1926).

Layaná.—Generally considered *Arawak*, but placed by Nimuendajú (map and index) in *Guaicurú*.

Juri (Suri).—Perhaps *Guaicurú*, probably sedentary *Tonocoté*.

Querandí (q. v.).—Placed by Rivet (1924 a) in *Guaicurú* without any certainty. Others include *Charrúa* (q. v.).

Mahoma or Hohoma.—Judging by linguistic position, according to Metraux (Handbook, vol. 1, p. 225), they may have been related to *Toba* or *Mocoví*.

The relationships of *Aguilot* and of *Cocolot* are based on historical, not on linguistic, evidence.

Brinton (1891 a, p. 315) adds to his *Guaicurú* Family: *Chica*, *Orejón*, *Churumata*, *Malbalai*, *Matagayo-Churumata*, *Quiniquinaux*, *Tereno*, and *Yapitilagua* or *Pitilaga*. Some of these are probably synonyms, others generally placed in other families. Loukotka (1935) lists the language *Karraim*, apparently mentioned by no other of the authorities consulted.

A number of the tribes in this region seem to have adopted *Guaicurú* relatively recently. Prominent among these are the *Tereno*, *Kinikinao*, *Layaná*, and some of the scattered groups of *Guaná* (q. v.), who apparently originally spoke *Arawakan*. They might therefore be classified in either of these "families," and are often differently classified by different authorities. On the accompanying linguistic map they are given as *Arawakan*.

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[15] See especially J. P. Harrington's opinions (1943) on *Quechua*.

GUAICURÚ

- I. *Guaicurú*
  - A. Northern
    - 1. *Mbayá-Guaicurú*
      - a. West: *Caduveo* (*Cadiguegodí*), *Guetiadegodí* (*Guetiadebo*)
      - b. East: *Apacachodegodegí* (*Mbayá Mirim*), *Lichagotegodí* (*Icachodeguo ?*), *Eyibogodegí*, *Gotocogegodegí* (*Ocoteguebo ?*)
      - c. *Payaguá* (*Lengua*):
        - *a.* North: *Sarigué* (*Cadigué*)
        - *b.* South: *Magach* (*Agacé*, *Siacuás*, *Tacumbú*)
- II. Frentones
  - A. Middle
    - 1. *Toba* (*Tocowit*)
      - a. *Toba: Guazú, Komlék, Michi* (*Miri*), *Cocolot, Lanyagachek, Mogosma, Chirokina, Natica*
      - b. *Pilagá*
      - c. *Aguilot*
  - B. South
    - 1. *Abipón* (*Callaga*)
      - a. *Mapenuss* (*Yaukanigá*)
      - b. *Mepene*
      - c. *Gulgaissen* (*Kilvasa*)
    - 2. *Mocoví* (*Mbocobí*)

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Guaicurú.—Brinton, 1898 a; Hermann, 1908; Huonder, 1902; Imbelloni, 1936; Koch-Grünberg, 1902 b; Lafone-Quevedo, 1910 (1912); Lozano, 1941; Martius, 1867, 2:127–129; Schuller, 1906.

Mbayá—Caduvéo—Payagua.—Adam, 1899; Aguirre, 1898, pp. 490–501 (*Lengua*); Boggiani, 1895, 1900; Castelnau, 1852, pp. 280–282; Gilij, 1780–84, pp. 367–371; Kersten, 1905; Koch-Grünberg, 1903, pp. 45–70; Lafone-Quevedo, 1892 b, 1896 c, 1897 b; Loukotka, 1929–30, pp. 99–106, 1933; Sánchez Labrador, 1896; Vellard, 1937; Vellard and Osuna, 1934.

Toba.—Adam, 1899; Aguirre, 1898; Anonymous, 1933 a; Barcena, 1893; Cardus, 1886, p. 321; Ducci, 1904, 1905, 1911–12; Karsten, 1923, 1932, pp. 127–223, Kersten, 1905 (*Toba, Pilagá, Aguilot*); Koch-Grünberg, 1903, pp. 70–82; Lafone-Quevedo, 1893; Lehmann-Nitsche, 1925 a; Loukotka, 1929–30 (*Toba, Pilagá*); Nusser-Asport, 1897; Palavecino, 1931–33 (*Pilagá*); Tebboth, 1943.

Abipón—Mocoví.—Adam, 1899; Adelung and Vater, 1806–17; Aguirre, 1898, pp. 491–504; Dobrizhoffer, 1784; Ducci, 1911–12; Kersten, 1905; Lafone-Quevedo, 1892 a, 1892 b, 1892–93, 1893 a, 1893 b, 1896–97; Larrañaga, 1924 a; Tavolini, 1856.

Guachi.—Castelnau, 1852, pp. 278–280; Kersten, 1905; Martius, 1867, 2:131–133.

Tereno.—Baldus, 1937.

LULE-VILELAN

"*Lulela*" would be a good mellifluous hybrid term for this "family" if its validity is finally definitely established. The two groups have been linked in classifications since earliest days, but Loukotka (1935) separates them into two families. This suggests that they differ greatly, with a possibility of nonrelationship. The terms applied to the joint group, however, have been many: Brinton (1891 a) and Chamberlain (1913 a) called it *Lule*, Nimuendajú (map, index) prefers *Vilela;* Loukotka (1935) uses both *Lule* and *Vilela.* Rivet (1924 a) and Pericot (1936) term it *Vilela-Chunupí;* W. Schmidt (1926) and Métraux (Handbook, vol. 1, p. 227) prefer *Lule-Vilela*, here adopted.

Though it may be possible that a few *Vilela*-speaking Indians remain, the languages of the group are practically extinct. The linguistic data are relatively few. There is so much disagreement regarding the affiliations of languages in this region that it is not unlikely that many "families" will eventually be found to be related. Métraux suggests that a careful comparison with *Mataco* might prove significant. Other possible distant relatives are *Diaguita, Macá, Sanavirón, Comechingón, Charrúa*, etc.

Even for this region there is an unusual amount of disagreement and question regarding the component languages of the group. Some authorities place *Tonocoté* (q. v.) with *Lule;* others put this language under *Diaguita*, but most consider it related to *Mataco.* There were two groups of *Lule;* the sedentary mountain *Lule*, the *Lule* of Barcena, spoke *Quechua, Tonocoté*, and *Diaguita;* the *Lule* of Machoni spoke *Lule-Vilela.* The *Lule-Vilelan Chunupí* (*Chulupí, Sunupí*) of the Bermejo River must be distinguished from the *Mataco Chunupí* (*Choropí*) of the Pilcomayo River. Loukotka (1935) includes *Cacán* (*Diaguita*) and *Sanavirón* (q. v.) with *Vilela;* Jijón y Caamaño includes *Sanavirón.* Nimuendajú (map and index) apparently includes *Güenoa*, which all others consider as *Charrúa.* Possible members of the family, according to Métraux, are *Matará* (q. v.) (Rivet, 1924 a: *Vilela-Chunupí;* Nimuendajú: unclassified), who were probably related to the *Tonocoté* (q. v.); *Malbalá* (Rivet, 1924 a: *Mataco;* Nimuendajú: unclassified), who were associated with the *Vilela; Palomo.*

LULE-VILELA

I. *Lule*
    A. *Great Lule* (of Miraflores, of Machoni)
    B. *Small Lule*
        1. *Isistiné*
        2. *Tokistiné*
        3. *Oristiné*
II. *Vilela*
    A. *Atalalá*
    B. *Chunupí* (*Sinipé, Chulupí*)
        1. *Yooc* (*Yoo, Wamalca*)
        2. *Ocolé*
        3. *Yecoanita*

LULE-VILELA—Continued

II. *Vilela*—Continued
   - C. *Pasain* (*Pazaine*)
   - D. *Omoampa* (*Umuapa*)
   - E. *Vacaa*
   - F. *Vilela*
   - G. *Ipa*
   - H. *Takete*
   - I. *Yoconoampa* (*Yecunampa*)
   - J. *Wamalca*
   - (K. *Malbalá* ?)

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Lule.—Adelung and Vater, 1806–17; Brinton, 1898 a; Calandrelli, 1896; Huonder, 1902; Kersten, 1905; Lafone-Quevedo, 1894; Machoni de Cerdeña, 1732, 1894; Techo, 1673.

Vilela-Chunupí-Choropí.—Adelung and Vater, 1806–17; Lafone-Quevedo, 1895 a; Lizondo Borda, 1938.

TONOCOTÉ, MATARÁ, AND GUACARÁ

These three extinct languages had best be left unclassified. All may be related. Rivet (1924 a) places them under *Vilela-Chunupí*, others with *Mataco*. *Tonocoté* is especially in dispute. Métraux (Handbook, vol. 1, p. 232) believes that the *Matará* spoke *Tonocoté*, which is included in the *Lule* region in the linguistic map herewith. Nimuendajú places *Tonocoté* with *Mataco*; the resemblance between the terms *Tonocoté* and *Nocten* is suggestive. They might also have been related to *Diaguita*, as Schmidt (1926) suggests. (See also Handbook, vol. 2, p. 657.)

Bibliography.—Calandrelli, 1896; Lizondo Borda, 1938; Machoni de Cerdeña, 1732.

ARAWAKAN

Arawak is probably the largest and most important linguistic family in South America, both in extent and in number of component languages and dialects. It extends, or extended, from Cuba and the Bahamas, perhaps even from Florida, to the Gran Chaco and the sources of the Xingú, possibly even to Uruguay (*Chaná*), and from the mouth of the Amazon to the eastern foothills of the Andes, possibly to the highlands (*Uru*), or even to the Pacific (*Chango*). In various groups, sometimes continuous, sometimes isolated, it ranges throughout this area. The distribution is very similar to that of the other great family of the tropical lowlands, the *Carib*. The original home and point of distribution is supposed to have been the Orinoco and Rio Negro region of the borders of Guiana, Venezuela, and Brazil. If the *Uru-Puquina* languages are actually related to *Arawak*, that may have been the first migration. *Arawak* languages seem to have been supplanted in places by *Carib* tongues, in other parts by Highland languages, *Aymara* and *Quechua*. The numbers of *Arawak*-speaking peoples are rapidly diminishing, and many tribes and languages are now extinct.

Other names applied to the family have been *Maipure* (Gilij, 1780–84) and *Nu-Aruac* (Steinen, 1886). Several suggestions for wider relations have been made. If *Arawak* is ever linked in a phylum with other recognized families other than with small groups of present questionable independence, it will probably be with the *Carib*. A suggested tie-up with *Tupí* is less likely. Schuller (1919–20 a, 1928) believes in a great phylum including at least *Arawak*, *Carib*, *Chibcha*, and *Maya*, but he never presented cogent proof; his opinion has been accorded little consideration.

A typical *Arawakan* language (*Campa*) shows absence of nominal incorporation. The pronominal subject is prefixed, the object suffixed. There are temporal suffixes and modal prefixes. Verbal suffixes precede the pronominal object. The nominal plural is expressed by a suffix. The same stem is generally employed for verb, noun, and adjective, the distinctions made by affixes. *Arawakan* languages generally have gender distinctions. The first person pronoun is usually *nu*, whence the generic name *Nu-Arawak;* the second person is generally *p* or *pi*.

The correct grouping of the hundred-odd *Arawak* languages is an impossible task. Many of the extinct ones will never be classified with certainty, and the data on most of the living tongues are insufficient. No comprehensive classification on a linguistic basis accompanied by evidence has ever been attempted.[16]

Probably because of the large number of *Arawak* languages, and the poverty, both quantitative and qualitative, of the data upon them, no comparative *Arawak* grammar has yet been published. Rivet (1924 a), W. Schmidt (1926), and Loukotka (1935) have presented classifications. These vary greatly; each contains certain languages considered independent by the others. Schmidt's is the most detailed, with 7 main divisions and 16 subgroups. Loukotka has 14, 4 of which consist of a single "mixed" language. Rivet makes seven principal divisions. The main points of difference are: One of Schmidt's groups is the *Jívaro* (q. v.), generally accepted as independent. Loukotka makes an independent family, the *Arauá*, of some of the languages of the *Arauá* or *Juruá-Purús* group. Schmidt considers the *Tacana* group as an independent family. Loukotka includes the *Chamicuro*, generally considered as *Pano* or *Aguano*. Rivet links the *Goajiro* and the languages of the Orinoco and the northern branches of the Amazon to those of the upper Xingú and the *Paressí* and *Saraveca* of Bolivia. In another division he joins the *Arua* group of the Juruá-Purús region with the *Guaná* Group of the Paraguayan Gran Chaco. Since Rivet seems not to have presented the evidence for these unexpected groupings, and since they were not accepted in the later classifications of Schmidt and Loukotka, the more common geographical grouping has been herein accepted as the basis for classification, using the more detailed and less radical divisions of Schmidt as a base. There is general, but far from complete, agreement on the composition of the minor subdivisions.

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[16] One may be expected in one of the promised volumes by Perea y Alonso (1942 *et seq.*).

ARAWAKAN CLASSIFICATION

I. Northern
    A. Insular [1]
        1. Lesser Antilles
            a. *Igneri*
            b. *Cabre* [2]
        2. Greater Antilles
            a. *Taino*
            b. *Sub-Taino*
            c. *Ciquayo*
            d. *Lucayo*
    B. Northwestern
        1. *Goajiro* [3]
            a. *Goajiro: Cosina(?),*[4] *Gobuxegual, Gimbuxegual*
            b. *Guanebucan*
            c. *Parauhano: Toa, Alile*
            d. *Tairona(?)* [5]
            e. *Chimila(?)* [5]
        2. *Caquetío*
            a. *Caquetío:*[6] *Guaicari*
            b. *Achagua: Tayaga, Yaguai, Chucuna, Amarizana,*[7] *Caouri*
            c. *Tecua(?)*
            d. *Motilón* of Catatumbo and Rio de Oro (?) [8]
        3. *Guayupé*
            a. *Guayupé*
            b. *Eperigua*
            c. *Sae*

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[1] Rivet (1924 a, pp. 249–250) does not mention this group in his classification of *Arawak* languages.

[2] Probably identical with the *Cabre* or *Caberre* of the Orinoco.

[3] Rivet puts *Goajiro, Paressí,* and *Saraveca* of Bolivia, the languages of the upper Xingú, and those of the Orinoco and northern Amazon in the same group.

[4] Reichel-Dolmatoff (personal communication) says that, although located in the middle of the Goajira Peninsula, surrounded by *Goajiros* and always considered as *Goajiran,* the *Cosina* are not *Goajiro* and do not speak *Arawakan.*

[5] See separate article on "Tairona and Chimila" in the *Chibchan* section. Reichel-Dolmatoff (personal communication) believes that the *Chimila* are *Arawakan;* if so, the *Tairona* probably were also.

[6] W. Lehmann (1920) considers *Caquetío* as *Chibchan,* related to *Betoi.*

[7] W. Schmidt (1926) classifies *Amarizana* as *Carib.*

[8] Reichel-Dolmatoff (personal communication) says that, although the *Motilón* of the Sierra de Perijá are pure *Cariban,* those of Catatumbo and Rio de Oro are very different and seem to be *Arawakan,* though the linguistic materials are very scarce.

ARAWAKAN CLASSIFICATION—Continued

- I. Northern—Continued
  - B. Northwestern—Continued
    - 4. *Piapoco* (*Dzase*)
      - a. *Piapoco*
      - b. *Cabre* (*Caberre*) [9]
      - c. *Mitua*
- II. Northern Amazon [10]
  - A. *Arawak*
    - 1. *Arawak*
    - 2. *Araua* (*n*) [11]
  - B. *Palicur*
    - 1. *Palicur*
    - 2. *Marawan*
  - C. Rio Branco
    - 1. *Wapishana* (*Wapiana, Wapityan*)
      - a. *Wapishana*
      - b. *Amariba*
    - 2. *Atoraí* (*Dauri*)
      - a. *Atoraí*
      - b. *Mapidian* (*Mayopityan*)
  - D. Orinoco Group [12]
    - 1. *Guinau* (*Quinhao, Inao*)
      - a. *Guaniare*
    - 2. *Maipure* [13]
    - 3. *Mawacuá*
    - 4. *Yavitero* (*Paraene, Yavita*)
  - E. Indeterminate Group [14]
    - 1. *Baniva* [15]
      - a. *Avani*
      - b. *Quirruba*
    - 2. *Baré* [16]
      - a. *Baré*
      - b. *Baraúna*
    - 3. *Arekena* (*Warekena*)
    - 4. *Cariaya*

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[9] Related to and probably identical with the *Cabre* of the Insular Group.

[10] Most of the languages below are listed by Gillin (Handbook, vol. 3, pp. 801–804). A few are added from other sources. Quite a number given by Gillin are here omitted. *Tarumá* and *Parauien* are considered later herein. In addition to those that Gillin admits to be of questionable *Arawak* affinities—*Apirua, Aramisho, Macapa, Marourioux, Pino, Purui, Tocoyen*—other authorities doubt three more. Nimuendajú leaves *Arekena* unclassified, Rivet considers *Parauana* as *Cariban*, and Nimuendajú believes *Pauishana* to be *Cariban*.

[11] The *Arauá* migrated from Marajó Island to Guiana. (See Nimuendajú, Handbook, vol. 3, p. 195.)

[12] This group contains only those languages that Rivet (1924 a) and W. Schmidt (1926) place in their Orinoco Group and Loukotka (1935) in his Guiana Group, except for *Guinau* which Loukotka places in the present Group C, the Rio Branco languages.

[13] Gilij (1780–84) applied the name *Maipure* to the *Arawak* family.

[14] Consisting of languages placed by Schmidt (1926) in his Orinoco Group, by Rivet (1924 a) in his Northern Amazon Group.

[15] *Baniva* is a generic term employed for all Arawak-speaking groups in the Northwest Amazon region. The larger number of so-called *Baniva* languages are listed in the Rio Negro Group and the entire bibliography is therein.

[16] Distinguish *Baré* from Bolivian *Bauré*.

ARAWAKAN CLASSIFICATION—Continued

- II. Northern Amazon—Continued
  - F. Rio Negro Group
    - 1. *Izaneni* (*Baniva*) Division
      - a. *Carútana* (*Cazuzana*): *Yawarete-Tapuya*, *Baniva* do Icana, *Wadzoli dakenai*, *Mapache dakenei*, *Urubu-Tapuya*, *Dzawi-minanei*, *Adaru-Minanei*, *Arara-Tapuya*, *Yurupari-Tapuya.*
      - b. *Catapolítani* (*Kadaupuritana*)
      - c. *Caua- Tapuya* (*Maulieni*)
      - d. *Cuati* (*Costi-Tapuya*, *Capité-Minanei*)
      - e. *Huhuteni* (*Hohodene*)
      - f. *Mapanai* (*Ira-Tapuya*)
      - g. *Moriwene* (*Sucuriyú-Tapuya*)
      - h. *Payualiene* (*Payoarini*, *Pacú-Tapuya*)
      - i. *Siusí* (*Walipéri-Tapuya*): *Ipeca-Tapuya* (*Cumata-Minanei*)
      - j. *Tapiira*
    - 2. *Miritiparaná* Division
      - a. *Cauyarí* (*Karyarí*)
      - b. *Matapi*
      - c. *Yucuna*
      - d. *Menimehe*
    - 3. *Mawaca* Division
      - a. *Adzaneni* (*Tatu-Tapuya*)
      - b. *Mandawaca*
      - c. *Masaca*
      - d. *Yabaana*
    - 4. *Tariana* Division
      - a. *Tariana*
      - b. *Itayaine* (*Iyaine*)
    - 5. Yapurá Division A
      - a. *Wainumá* (*Uainumá*)
      - b. *Mariaté*
    - 6. Yapurá Division B[17]
      - a. *Cayuishana* (*Cawishana*)
      - b. *Pasé* (*Passé*)
      - c. *Yumana* (*Chimana*)
      - d. *Manao*
      - e. *Aruaki*
    - 7. *Wiriná*[18] (*Uirína*)
- III. Pre-Andine[19]
  - A. Amazonian
    - 1. *Marawa*[20]
    - 2. *Waraicú* (*Araiku*, *Uraicu*, *Wareku*)

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[17] Loukotka (1935) separates the *Yapura* Group as generally accepted, and places the last three languages in a separate group as "Languages mixed with Macú."

[18] Schmidt places *Wiriná* in a group by itself.

[19] W. Schmidt (1926) distinguishes between the Pre-Andine (Montaña) and the Juruá-Purús languages, but his division of these is greatly at variance from that of Métraux and Steward (q. v.) generally accepted herein. Loukotka (1935) considers them all as Pre-Andine. The division is probably purely a geographical one, with border-line instances; linguistically probably all fall together. The Pre-Andine languages are said to differ little from those of the North Amazon. (See Rivet and Tastevin, 1919–24.)

[20] Distinguish from *Marawan* of Guiana.

ARAWAKAN CLASSIFICATION—Continued

- III. Pre-Andine—Continued
    - B. *Cutinana* Group
        - 1. *Cutinana*
        - 2. *Cuniba*[21]
        - 3. *Cujisenayeri* (*Cujigeneri, Cushitineri*)
    - C. Juruá-Purús
        - 1. *Canamari*[22]
        - 2. *Catukina*[23]
        - 3. *Catiana*
        - 4. *Inapari*
        - 5. *Ipuriná*[24] (*Hypurina*)
            - a. *Cangutu*
            - b. *Casharari*
        - 6. *Maniteneri*
        - 7. *Wainamari* (*Uainamari*)
    - D. Montaña (Chuncho)
        - 1. *Campa*
            - a. *Anti*
            - b. *Antaniri* (*Unconino*)
            - c. *Camatica*
            - d. *Campa* (*Atiri*)
            - e. *Catongo*
            - f. *Chicheren*
            - g. *Chonta*
            - h. *Kimbiri*
            - i. *Kirinairi*
            - j. *Pangoa*
            - k. *Tampa*
            - l. *Ugunichiri*
            - m. *Unini*
        - 2. *Piro*
            - a. *Manatinavo*
            - b. *Chontakiro*
            - c. *Simirinch*
            - d. *Upatarinavo*
        - 3. *Machiguenga* (*Amachengue*)
        - 4. *Masco*[25]
        - 5. *Sirineri*
        - 6. *Wachipairi* (*Huachipari*)
        - 7. *Puncuri*
        - 8. *Pucpacuri*
- IV. South
    - A. Bolivia
        - 1. Bolivia
            - a. *Mojo* (*Moxo*): *Muchojeone*
            - b. *Bauré*
        - 2. Chiquito
            - a. *Paiconeca, Paunaca*

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[21] Distinguish from *Panoan Conibo*.

[22] Distinguish from *Panoan* and from *Catukinan Canamari* or *Canamare*.

[23] Distinguish from *Catukina* "family."

[24] Formerly considered an independent family by Chamberlain (1913 a) and Brinton (1891 a).

[25] Aza (1935) writes of the "Arasaire or Mashco." The former are generally regarded as *Panoan*.

ARAWAKAN CLASSIFICATION—Continued

- IV. South—Continued
  - B. *Paressi*[26] (*Ariti*)
    - 1. *Cashiniti*
      - a. *Waimaré*
    - 2. *Iranché*[27]
      - a. *Sacuriú-iná*
      - b. *Tahuru-iná*
      - c. *Timaltiá*
    - 3. Cozárini
      - a. *Wild Cabishi*
      - b. *Paressi-Cabishi*
      - c. *Mahibarez*
  - C. *Saraveca*
  - D. Paraná[28]
    - 1. East: *Guaná*[29] (*Chuala, Chaná*)
      - a. *Layaná* (*Niguecactemigi*)
      - b. *Tereno*
      - c. *Echoaladi* (*Echenoana, Chararana*)
      - d. *Kinikinao* (*Equiniquináo*)
    - 2. West: *Chané*[29]
      - a. *Izoceño*
  - E. Xingú
    - 1. Xingú
      - a. *Mehinacú*
      - b. *Yaulapiti* (*Jaulapiti*)
      - c. *Custenau* (*Kustenahú*)
      - d. *Waurá* (*Uaure*)

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[26] Métraux (Handbook, vol. 3, p. 349, ftn. 1) says that *Paressi* is closer to *Mehinacú* than to *Mojo*.

[27] M. Schmidt (1942) claims that *Iranché* is not *Arawakan* (Métraux, Handbook, vol. 3, ftn. 2, p. 349).

[28] Many of these groups, such as the *Layaná, Tereno, Kinikinao*, and probably some others have abandoned their former *Arawak* speech and now speak *Guaicurú*. They are, therefore, properly placed under *Guaicurú* in some classificatory systems.

[29] See following article on "Chané and Chaná."

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Parauhano.—Jahn, 1914, 1927, pp. 190–197; Oramas, 1918 a, 1918 b.

Caquetío.—Jahn, 1927, pp. 199–223.

Achagua.—Adelung and Vater, 1806–17; Alemany y Bolufer, 1929 a, 1929 b; Gilij, 1780–84, p. 346; Jahn, 1927, pp. 377–378; Oramas, 1916.

Piapoco.—Crévaux, Sagot, and Adam, 1882, pp. 242–249; Koch-Grünberg, 1928, pp. 287–301; Tavera-Acosta, 1907, pp. 85–95.

Cabre.—Gumilla, 1745; Roth, 1924.

Arawak.—Brinton, 1871; Crévaux, Sagot, and Adam, 1882; Ferreira-Penna, 1881 (*Aruan*); Goeje, 1928 a; Martius, 1867, 2:307–311; Mordini, 1935 (*Aura'an*); Penard, T. E., 1926–27; Stahel, 1944; Tavera-Acosta, 1907, pp. 333–335.

Palicur-Marawán.—Martius, 1867, 2:324; Nimuendajú, 1926; Rivet and Reinburg, 1921.

Wapishana.—Coudreau, H., 1887, pp. 477–87; Farabee, 1918 b, pp. 13–132, 183–274; Grupe y Thode, 1890, p. 254; Koch-Grünberg, 1922, p. 220 (*Amariba*); Koch-Grünberg and Hübner, 1908, pp. 35–39, 44; Schomburgk, 1847–48, (*Amariba*).

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Baré Group.—Chaffanjon, 1889, pp. 330–333; Chamberlain, 1910 a (*Cariaya*); Crévaux, Sagot, and Adam, 1882, pp. 251–252; Koch-Grünberg, 1909–10, pp. 56–153 (*Baré, Warekena*), 1913, p. 455 (*Arecuna*), 1928, pp. 246–257 (*Arecuna*), pp. 272–278; Martius, 1867, 2:230–231, 285–286, 231–232 (*Cariay*); Montolieu, 1882, 1895; Nimuendajú, 1931–32, pp. 592–595 (*Baré, Uarekena*); Tavera-Acosta, 1907, pp. 63–84 (*Baré, Uarekena*); Tello, 1913 b.

Baniva.—Chaffanjon, 1889, pp. 337–341; Crévaux, Sagot, and Adam, 1882, pp. 253–255; Gumilla, 1745; Koch-Grünberg, 1909–10; La Grasserie, 1892; Martius, 1867, 2: 261–263; Montolieu, 1882, pp. 276–280; Nimuendajú, 1931–32, pp. 590–592; Tavera-Acosta, 1907, pp. 53–62.

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Cauyari-Yucuna.—Crévaux, Sagot, and Adam, 1882; Koch-Grünberg, 1909–10, 1911, pp. 56–153, 203–257; Martius, 1867, 2: 253.

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Wainumá-Mariaté.—Martius, 1867, 2: 245–249, 266–268; Wallace, 1853.

Yapura Group.—Brinton, 1892 a (*Manao*); Martius, 1867, 2: 221–222 (*Manao*), 229 (*Uirina*), 250–252 (*Jumana*), 254–256 (*Passé*), 257–260 (*Cauixana*).

Marawa-Waraicú.—Martius, 1867, 2: 223–225, 233–234.

Cuniba.—Nimuendajú and Valle Bentes, 1923, pp. 215–217.

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Xingú Group.—Steinen, 1886, pp. 357–360 (*Custenau*); 1894, pp. 523–532 (*Mehinacú, Yaulapiti, Custenau Waura*).

CHANÉ AND CHANÁ

The name *Chané* is applied especially to several small isolated enclaves of *Arawak*-speaking peoples, the southernmost *Arawak* groups. It is, however, unfortunately, frequently confused with *Chaná*. Thus Brinton (1891 a) lists the *Chané* among the *Charrúan* (q. v.) tribes of Uruguay; these are today known as *Chaná* (q. v.). It was probably this analogy that led Perea y Alonso (1942) to claim the *Charrúa* to be *Arawak*. On the other hand, certain *Arawak* groups, especially the *Layaná*, seem to be known as *Chaná*. *Guaná* is probably a term related to *Chaná*.

LANGUAGES OF PROBABLE ARAWAKAN AFFINITIES

ARAUÁ GROUP [17]

The nature and composition of the group of *Arauá* languages are much disputed. Brinton (1891 a, p. 293) made an *Arauá* stock, composed of *Arauá*, *Pama*, *Pammary*, and *Purupurú*. Loukotka, in his 1935 classification, also proposed an *Arauá* family, but made it composed of *Arauá*, *Yamamadí*, and *Pammarí*; however, in 1939 he put the group back under *Arawak* and added the languages *Kulina* and *Madiha*. Nimuendajú (map) accepts *Yamamadí*, *Pammary-Purupurú*, *Yuberi*, and *Culino* as *Arawak* but refuses to classify *Arauá*, *Sewacu*, *Pama*, and *Pamana*. Rivet (1924 a) includes all these in his *Arauá* group of *Arawak*, and considers the languages to fall with the *Guaná-Tereno-Layaná* group of Paraguay. The following classification is, therefore, very tentative:

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[17] The *Arawakan Arauá* must be distinguished from a small *Panoan* group on the Madre de Dios River and from several other groups with somewhat similar names.

ARAUÁ GROUP

1. *Arauá*
2. *Culino*
    - a. *Culina*
    - b. *Curia*
    - c. *Curiana*
    - d. *Culiña*
3. *Pama*
    - a. *Pama*
    - b. *Pamana*
4. *Yamamadí*
    - a. *Yamamadí: Capaná, Capinamari, Colo*
    - b. *Purupurú: Paumarí (Pammarí)*
    - c. *Yuberi*
5. *Madihá*
6. *Sewacu*
7. *Sipó*

Bibliography.—Carvalho, 1929, 1931, pp. 246–248 (*Culina*); Chandless, 1866, p. 118 (*Paumarí*), 1869, p. 311 (*Arauá*); Ehrenreich, 1897 b (*Pammarí, Yamamadí*); Rivet and Tastevin, 1938–40; Steere, 1903, pp. 386–387 (*Yamamadi*), 390–393 (*Paumari*).

APOLISTA OR LAPACHU

Chamberlain (1910 a) established an independent *Apolistan* family, based on early data. Crequi-Montfort and Rivet (1913 d) joined this to the Pre-Andine group of *Arawak*, mainly on the basis of a small vocabulary collected by Nordenskiöld from one of the last speakers. This classification has been accepted by all recent authorities. Loukotka (1935) finds vestiges of *Leco* in the language which was known as *Lapachu* (*Lapaču, Lapatšu*) and has now been replaced by *Quechua*. The *Apolista* may be descendants of the *Aguachile* (Métraux, Handbook, vol. 3, p. 506).

Bibliography.—Cardus, 1886; Chamberlain, 1910 a, pp. 179–180; Créqui-Montfort and Rivet, 1913 d; Métraux, 1942 a, pp. 29–30; Nordenskiöld, 1905; d'Orbigny, 1839, pp. 173–174.

AMUESHA

Synonyms: *Amagues, Amage, Amaje, Amoeshe, Amoiše, Amoische, Amoixa, Amueixa, Amuesa, Amueša, Amuese, Armueshe, Lorenzo, Omaje, San Lorenzo.*

The *Arawak* affiliations of *Amuesha* are questioned. Chamberlain (1913 a) considered it an independent family, the *Lorenzan*. Tello (1913 b) first suggested its *Arawak* affinities, but despite this Rivet (1924 a) preferred to classify it as independent. Loukotka (1935) places *Amoiše* with the Pre-Andine *Arawak;* Tessman (1930) sees *Tupí* elements in a mainly *Arawakan* language. Jijón y Caamaño

(1941–43) gives it independent status as a phylum. Steward and Métraux herein (Handbook, vol. 3, p. 536) call the *Amuesha* "linguistically similar to the *Campa*"; this statement does not seem to be borne out by the evidence. Mr. Louis Rankin writes (personal correspondence) from personal acquaintance, that, "The Amuexias to the west of the Campa are said to be a subtribe, but their language is quite different." They have for some time spoken *Quechua*. The *Lorenzo* and *Panatawa* are, or were probably related.

Bibliography.—Chamberlain, 1910 a, p. 191 (*Lorenzan*); Farabee, 1922; Izaguirre, 1927–29; Sala, G., 1897, 1905–06; Tello, 1913 b; Tessmann, 1930, pp. 367–368, 617.

TUCUNA (TIKUNA)

Nimuendajú (Handbook, vol. 3, p. 713) advances arguments for his opinion that, following Chamberlain (1910 a) and Tessmann (1930), *Tucuna* should be considered independent or isolated, not placed under *Arawak*, following Rivet (1912 b, 1924 a), who thinks it a very altered *Arawakan* tongue. However, W. Schmidt (1926), Krickeberg (1922), Loukotka (1935), and Igualada and Castellví (1940) accept the *Arawakan* connection. Loukotka thinks it is mixed with *Mura* and *Tucano*.

Bibliography.—Brinton, 1892 a, pp. 7–20; Castelnau, 1852, pp. 298–299; Chamberlain, 1910 a, p. 198; Marcoy, 1875, p. 379; Martius, 1867, 2:159–161 (*Tecuna*); Nimuendajú, 1931–32, pp. 573–580 (*Tikuna*); Rivet, 1912 b; Tessmann, 1930, pp. 564–565, 617 (*Tikuna*).

TARUMÁ

Tarumá has been generally classed as an *Arawakan* language (Rivet, 1924 a; Loukotka, 1935; W. Schmidt, 1926; Gillin, Handbook, vol. 3, p. 803), but Nimuendajú (map) places it among his isolated languages; this opinion is apparently based on no new published data. If *Arawakan*, it is apparently an unusually variant form, since Loukotka (1935) puts it in a subgroup of its own as a mixed language (other element not stated), and with vestiges of *Camacán;* the latter is most doubtful. Rivet (1924 a) states that it was related to the extinct *Parauien*.

Bibliography.—Farabee, 1918 b, pp. 135–138, 277–283.

TACANA

Synonyms: *Takana, Tecaná.*

There are three linguistic groups in northwestern South America known by variations of the *t-k-n* phonetic combination; with the inevitable vowel modifications they are, therefore, liable to confusion. The standard spellings of these three tribes are *Tacana*, *Tucuna* or

Tikuna, and *Tucano;* each has been formerly accorded independent position.

The linguistic position of the *Tacana* group is a most uncertain and controversial question, and one that will require much intensive study for a definitive opinion. *Tacana* was accorded independent status by the early authorities, Brinton (1891 a) and Chamberlain (1913 a). As a result of an exhaustive comparative study, Créqui-Montfort and Rivet (1921–23) put it under *Arawak,* in which opinion they are followed by Rivet (1924 a), Pericot y García (1936), and Loukotka (1935). W. Schmidt (1926), Krickeberg (1922), K. G. Grubb (1927), and the authors of the monographs in this Handbook wisely prefer to leave it as independent, or at least unclassified and doubtful.

Coterminous with both *Panoan* and *Arawakan* languages, the *Tacanan* languages show resemblances to both; the resemblance to one should be genetic, to the other the result of borrowing. Morphologically, the resemblance is much greater with *Panoan,* a fact that should carry great weight for genetic connection. Some 65 of the 101 words compared by Rivet are either identical or very similar in *Tacanan* and *Panoan,* so similar that the presumption is for recent borrowing, although the words are mainly basic ones, and few are in modernistic categories. Of the 101 words compared, 60 occur in only one language, or in one small group of languages, either *Panoan* or *Tacanan,* and are, therefore, presumably not original in these stocks; another 17 seem to be common also to *Arawakan,* leaving only 24 really pertinent cases.

Regarding the *Arawakan* resemblances, since 25 *Tacanan* vocabularies are compared with 65 *Arawakan* ones, a large number of fortuitous apparent resemblances would be expected; many of them occur in only one language; in many others the meaning is greatly changed. Of the 178 examples only a dozen or so would qualify as apparent certainties, and half of these are of domesticated plants or animals, such as dog, cotton, maize, manioc, and tobacco. No rules of sound change are suggested and none are apparent. The genetic relationship of *Tacanan* to *Arawakan* requires much more careful study before it can be accepted. *Tacanan* has also many words in common with *Aymara* and *Quechua,* but these are almost certainly borrowings, mainly from *Aymara.*

Armentia (1902) gives the names of some 40 subtribes or dialects of *Araona,* some of which are also found in the table below. *Araona* and *Caviña* are inextricably mixed, but some groups are pure *Araona,* and some pure *Caviña. Caviña* and *Cavineño* are not synonymous, according to Rivet, and the latter not a subdivision of *Araona.* Rivet also does not group *Guacanagua, Sapibocona,* or *Maropa* with any other languages. He distinguishes between *Toromona* and *Turamona,* the latter a *Tacana* subgroup. There are no data on *Guacanahua*, but the *Tacana* affinities are vouched for by Cardus (1886) and Nordenskiöld (1905). The extinct *Sapibocona* are probably the same as the *Maropa*. Rivet considers *Chiragua* a subgroup of *Tacana*. Some of the *Arasa* speak *Tacanan*, but the group is really *Southwestern Pano* (*Arasaire*), and is also classified under *Pano*; the habitat is the same. Nordenskiöld's (1905) *Arasa* vocabulary is *Tacanan;* Llosa's (1906) *Arasaire* vocabulary, *Pano*.

Brinton (1891 a) also gives as subtribes *Equari*, *Samachuane*, *Carangue*, *Hucumano*, and *Torococy*, which Rivet claims cannot with certainty be identified with *Tacanan*, as being extinct without recorded data, or known by other names.

No one has attempted to subdivide the *Tacana* group or to classify the component languages on a scientific linguistic basis. The following table incorporates the opinions of all authorities consulted, and greatly contravenes none.

TACANA

A. *Araona Arauna, Arahuna*)
    1. *Capachene* (*Kapaheni*)
    2. *Caviña* (*Kavina*)
    3. *Cavineño*
    4. *Mabenaro*
    5. *Machui* (*Machuvi*)
B. *Arasa*
C. *Chirigua* (*Chiriba, Tširigua, Tširiba*)
    1. *Chumana*
    2. *Maropa*
    3. *Sapibocona* (*Sapiboka*)
D. *Guariza* (*Guaziza*)
E. *Tacana* (*Takana, Tucana*)
    1. *Ayaychuna*
    2. *Babayana*
    3. *Chiliuvo*
    4. *Chivamona*
    5. *Idiama, Isiama*
    6. *Pamaino*
    7. *Pasaramona*
    8. *Saparuna*
    9. *Siliama*
    10. *Tumapasa* or *Maracani*
    11. *Turamona* (*Toromona*)
    12. *Uchupiamona*
    13. *Yabaypura*
    14. *Yubamona*
F. *Tiatinagua* (*Tambopata-Guarayo*)
    1. *Guacanahua* (*Guanacanahua, Guarayo*[1])

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[1] Distinguish from *Tupí-Guaraní Guarayo* (*Huaraya, Guarayu*, etc.; some of the bibliographical references there noted possibly apply here instead, or vice versa).

TACANA—Continued

F. *Tiatinagua* (*Tambopata-Guarayo*)—Continued
  2. *Chama*
  3. *Baguaja* (*Baguajairi*)
  4. *Chunchu*
  5. *Echoja*
  6. *Huanayo*
  7. *Kinaki*
  8. *Mohino*
G. *Yamaluba*

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LANGUAGES OF POSSIBLE ARAWAKAN RELATIONSHIPS

TUYUNERI

The most recent compilers, Nimuendajú (map and index) and Loukotka (1935), prefer the spelling *Tuyoneri* to the standard *Tuyuneri*. This group is of later and less generally accepted standing than *Itonama*, *Canichana*, *Cayuvava*, *Movima*, and *Yurucare* (q. v.) in this region, and distant from them; it was discovered by Nordenskiöld (1906) in the early years of this century. *Tuyumiri*, assigned by Brinton (1891 a) to *Tacanan*, is probably an orthographical error; it is not mentioned by Chamberlain (1910 a, 1913 a). Markham (1910) identifies the *Tuyuneri* with the *Chunchos*, a generic name for Indians of the Montaña and hence a meaningless association. Rivet (1924 a), Pericot y García (1936), Loukotka (1935), and Nimuendajú (map and index) accept it as an independent family or as isolated; Loukotka sees vestiges of *Panoan* in it. However, Steward and Métraux (Handbook, vol. 3, p. 541) place it unequivocally among the *Arawakan* groups.

Bibliography.—Nordenskiöld, 1905, pp. 275–276.

JIRAJARA

Not mentioned by earlier writers, *Jirajara* has been accorded independent position by Rivet (1924 a), Loukotka (1935), and some other recent authorities. W. Schmidt (1926) follows Oramas (1916) in considering it related to *Arawak*, which may well be found to be the case when more scientific studies are made on its vocabulary and grammar. Hernández de Alba (Handbook, vol. 4, p. 469) dogmatically states that "the *Jirajara* . . . speak an *Arawakan* language (Oramas, 1916)." The most recent opinion, however, that of Febres Cordero (1942) is that it is not *Arawakan*, though containing many *Arawak* words, probably borrowed. Also about 10 percent of the words seem to show *Chibchan* connections. The *Ajágua*, given as a component language, may be synonymous with the *Achagua*, generally considered as *Arawak*. They may, however, be a separate group. The *Cuiba*, probably distinct from the *Guahibo* group of the same name, may be an *Ajagua* dialect.

JIRAJARA

1. *Gayón* (*Cayon*)
2. *Ayomán*
3. *Xagua*
    a. *Cuiba* (?)
4. *Jirajara*

Bibliography.—Febres Cordero, 1942; Jahn, 1927, pp. 379–395; Oramas, 1916.

JÍVARO

The *Jívaro* family has always been known by orthographic variants of this name, such as *Xivaro* and *Chiwaro;* it is probably a corruption of *Shuara* or *Shiwora*, their own term. The resemblance to the name of a neighboring family, *Záparo*, may be significant, but no genetic relationship with the latter has been suggested. The name apparently became used to imply a wild rustic person and is applied in Puerto Rico to the native countryfolk of the interior mountains. They must be distinguished from the *Cawapanan Chébero* (*Xébero*) and from the *Hibito*. The language is still spoken by some thousands of Indians, but several groups have adopted *Quechua*.

Except for a few borrowed words, *Jívaro* seems to have nothing in common with *Quechua*, *Tupían*, *Cawapanan*, *Záparoan*, or *Panoan*. There are, however, a large number of apparent correspondences with *Arawakan*, the resemblance with *Campa* being especially strong. This may possibly be due to borrowing, especially since there are some important morphological differences. Beuchat and Rivet (1909–10) hesitatingly decided to place *Jívaro* in the *Arawakan* family, but in his later classification (1924 a) Rivet again gave it independent status, in which he has been followed by all other authorities except W. Schmidt (1926). J. P. Harrington (personal correspondence), however, believes that the *Arawak* resemblances are genetic and that *Jívaro* is a very divergent form of *Arawak*.

Jívaro is said to be clear and harmonious. The phonetic pattern is more like that of Amazonian than that of Andean languages. There is a quasi-inflection, that is, terminal changes or suffixes for person and tense. Mechanism for pluralization is absent, and there is no trace of gender. Both classificatory prefixes and suffixes are found, and postpositions. Monosyllables are rare, and accent unimportant.

There may be said to be but one *Jívaro* language, relatively homogeneous, but very many dialects. Apparently no attempt has ever been made to subdivide the language, or to group the dialects. The subdivisions as generally given are presumably political and geographic, but the presumption is that the linguistic division would be roughly similar.

Jívaro

I. *Jívaro*
    A. *Shuara*
        1. *Aguaruna*
            a. *Alapico*
            b. *Indanza*
            c. *Iransa*
            d. *Maranza*
            e. *Santiago*
            f. *Patocuma*
            g. *Chiguasa*
            h. *Yuganza*
        2. *Wambisa*
            a. *Uambisa*
            b. *Cherembo*
            c. *Chirapa*
            d. *Chiwando*
            e. *Candoa*
            f. *Cangaime*
            g. *Mangosisa*
        3. *Achuale*
            a. *Capawari*
            b. *Copatasa*
            c. *Machine*
            d. *Pindu*
            e. *Wampoya*
        4. *Antipa*
        5. *Maca*
            a. *Walakisa*
            b. *Zamora*
            c. *Pintuc*
            d. *Ayuli*
            e. *Morona*
            f. *Miazal*
        6. *Upano*
        7. *Bolona*
        8. *Bracamoro* (*Pacamuru*)
    B. *Palta*[1]
        1. *Malacata*

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[1] See Murra, Handbook, vol. 2, p. 80.

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URU-CHIPAYA-PUKINA

The relationship of *Uru* (*Uro*) and *Pukina* (*Puquina*) to *Arawakan* is quite illogical. The *Uru-Puquina* inhabit the region of Lakes Titicaca and Poopó in Bolivia, about the highest, coldest, and most inhospitable area in South America; the majority of the *Arawak* languages are in the Tropic lowland forested regions. The evidence advanced for the affiliation (Tello, 1913 b; Créqui-Montfort and Rivet, 1921, 1925–27) falls far short of proof, but it has been accepted by practically all the recent authorities on classification: W. Schmidt (1926), Pericot y García (1936), Loukotka (1935), Jijón y Caamaño (1943), etc. The relationship was first suggested by Tello (1913 b), the data for proof presented by Créqui-Montfort and Rivet (1925–27). Several of the "Handbook" authors (see La Barre, Handbook, vol. 2, p. 575), including the present one, consider the evidence advanced insufficient, doubt the connection, and think that the data should be reviewed. Dr. J. P. Harrington, however, is convinced of its validity. Uhle (1896) suggested a relationship to *Yunca-Mochica*, and Loukotka (1935) calls them mixed languages, with vestiges of *Pano* and *Mosetene*. Many writers believe that the present *Uru* group is but a tiny remnant of a very early or autochthonous population that once occupied a much larger region, extending to, and including a large area on, the Pacific Coast. (See Jijón y Caamaño, 1941–43, map 3.) If the result of an *Arawak* migration, it was probably the first of these.

Three languages, *Uru*, *Pukina*, and *Chipaya*, are ordinarily placed in this group. The published vocabularies, however, show such differentiation that even the interrelationship of these is not beyond question. Uhle (1896), Polo (1901), and Boman (1908) believed *Pukina* and *Uru* distinct, and Chamberlain (1910 a, 1913 a) distinguished *Puquinan* and *Uran* families. Posnansky (1915) considers *Chipayan* an independent family distinct from the others. La Barre (Handbook, vol. 2, p. 575) says that the *Uru* "call their language

Puquina," but that the *Uru* language "is not the same as the *Puquina-Uro* of La Grasserie (1894)."

The data on the *Uru* group of languages seem to be exclusively lexical; grammatical material is a great desideratum.

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OCHOSUMA

Ochosuma or *Uchuzuma* may be a dialect of *Uru*, but had best be left with the unclassified languages.

CHANGO AND COAST URU

Insufficient data are available to classify *Chango*, an extinct language of miserable fishermen on the Chilean coast. As probable remnants of an early archaic population, an independent language is not unlikely, but this possibility is insufficient to justify the establishment of a separate family for them as Chamberlain (1913 a) did. The only data seem to be place and personal names, and the statement that they spoke a language different from their neighbors. Different opinions have placed them with the *Atacameño*, *Chono*, and *Alacaluf*. The most recent and thorough studies link them with the *Uru* (q. v.) of the Bolivian lakes, which linguistic group Rivet believes to be of *Arawakan* affinities. The argument is apparently based mainly on the fact that some groups adjacent to the *Chango* were known as *Uru*, and on a comparison of *Chango* names with Bolivian *Uru*. It is probable that the name *Uru* was applied to a number of nonrelated linguistic groups, just as the *Lacandón* in *Chiapas* are locally called "*Caribs*," and Puerto Rican countryfolk "*Jívaros*," and the existence of a group of true *Uru* on the Chilean coast is unlikely. At any rate the sources do not equate *Chango* and *Uru*. The suggestion that the Bolivian *Uru* had seasonal fishing colonies on the coast is improbable. Brand (1941 c) distinguishes between the *Northern Chango* or *Uru*, whom he believes to be linguistically *Uran*, and the *Southern* or *True Chango*, sometimes wrongly termed *Uru*, who were of unknown language. (See Handbook, vol. 2, pp. 575, 595–597.)

Bibliography.—Boman, 1908; Brand, 1941 c; Chamberlain, 1910 a; Cúneo Vidal, 1913; Garcilaso de la Vega, 1723; Knoche, 1931; Latcham, 1910; Lozano-Machuca, 1885; Santa Cruz, 1913.

CARIBAN

The *Carib* is one of the great linguistic families of South America, both in number of component languages and dialects and in extent, which is only less than that of the *Arawak* and *Tupí*. *Carib* languages are (or were) found from the Greater Antilles to central Mato Grosso, and from eastern Perú to central Pará. *Cariban* and *Arawakan* groups have much the same distribution, but isolated *Carib* groups are much fewer. The great mass of the *Cariban* are north of the Amazon, occupying a great area that includes much of the Guianas, Venezuela, northern Brazil, and lowland Colombia. Nevertheless, the point of origin and dispersion is claimed to have been the region between the upper Xingú and the Tapajóz.

Suggestions have been made that *Carib* and *Arawak* may eventually be tied up in one great phylum. Schuller (1919–20 a, 1928) proposed the further inclusion of *Chibcha* and *Maya*. Though comparative studies on the *Carib* languages have been made by Adam (1893) and De Goeje (1910), the classification of the many *Carib* languages is still to be done on a thorough linguistic basis, and those proposed are mainly arranged geographically. Rivet (1924 a), W. Schmidt (1926), Loukotka (1935), and Simpson (1940) have offered such classifications, with major and minor subdivisions. Those of Schmidt and Simpson are the most detailed and have been here adopted as a basis, incorporating also some of the opinions of the others as well as those of Gillin and the other Handbook authors. Disagreements are, on the whole, few and minor.

In addition to many languages, mostly extinct, on which data are insufficient and the classification, therefore, in doubt, there are several large groups whose *Carib* affiliation is questioned. One such is the *Yagua-Peba* group (q. v.), long considered independent and so still regarded by Loukotka (1935) and Nimuendajú (index) but accepted as *Cariban* by W. Schmidt (1926) and Simpson (1940) on the basis of Rivet (1911 b). Rivet (1943) has also presented cogent arguments for the inclusion of *Chocó* (q. v.) and many other languages of Colombia formerly considered as affiliated with *Chibcha* (q. v.).

In the Guiana-Venezuela region, Gillin (Handbook, vol. 3, pp. 804–813) lists some 80 tribes—and presumably dialects—that he considers of *Cariban* affinity, as well as some 30 more, probably all extinct, that are questionably *Carib*. Most of these are small groups, many of them mentioned by no other authority except Nimuendajú, who includes them on his map. Not all of these groups will be listed here again. Among those considered as *Cariban* by Gillin, and this affiliation not disputed by others, are:

Acuria, *Cashuena*, *Chikena*, *Cuacua* (*Mapoyo*), *Gabinairi*, *Heurá*, *Kirikiripe*, *Panare*, *Paraviyana*, *Puricoto* (*Catawian*), *Saluma*, *Terecumá*, *Tivericoto*, *Tonayena*, *Waiwai*.

Other *Cariban* groups of undisputed relationship mentioned by Nimuendajú, Loukotka, and others, but not by Gillin, are:

Azumara, *Carib* of Maturin, *Mutuan*, *Wayewe*[18], *Zurumata*.

A number of Guiana groups, considered as *Cariban* by Gillin and others, are left unclassified by Nimuendajú, probably for lack of sufficient linguistic data. Among these are:

Acokwa, *Aracaret* (*Racalet*), *Ichu*, *Nourage* (*Norak*), *Pariki*, *Pirio* (*Apouroui*), *Pishaucó*, *Sapai* (*Suppaye*), *Taira*, *Wai* (*Ouaye*), *Waikeri* (*Guaiqueri*), *Wayaculé* (*Oyaricoulet*, *Amibouane* (?)), and *Yapacoye*.

The *Carib* affinities of the following groups are disputed, mainly by Nimuendajú:

Attaraya.—Given by Gillin both as *Cariban* and as a synonym of *Arawakan* *Atorai*.

Asepangong.—Nimuendajú apparently considers *Arawakan*.

Cariniaco.—Remarks same as for *Seregong*.

Pawishana (*Paushiana*).—*Cariban* according to Nimuendajú and Loukotka; *Arawakan* according to Gillin and Rivet.

Serecong.—*Arawakan* according to Nimuendajú; generally considered *Cariban*.

Yao.—*Cariban* according to most; Nimuendajú believes *Arawakan* or unclassified.

Taparito.—Nimuendajú and Rivet agree with Gillin in considering *Taparito* as *Cariban*. Kirchhoff (Handbook, vol. 4, p. 439) makes *Taparita* a variety of *Otomacan* (q. v.). W. Schmidt (1926) considers *Taparito* as isolated.

Carib Classification

I. Northern
    A. Coastal
        1. Insular
            Carib, *Calino*
        2. Mainland
            a. *Carib: Caribisi*, *Calinya*, *Galibi*
            b. *Cumanagoto*
            c. *Palank* (*Palenque*, *Guarine*)
            d. *Pariagoto* (*Paria*, *Guayuno*)
            e. *Oyana* (*Upurui*, *Wayana*): *Rucuyen*, *Urucuiana*
            f. *Chacopata*
            g. *Piritu*
            h. *Cunewara*
            i. *Shiparicot*, *Chipa*
            j. *Core*
            k. *Chaima* (*Sayma*, *Warapiche*): *Tagare*, *Cuaga*
            l. *Carinapagoto*
    B. Central
        1. Roraima Group
            a. *Acawai:* Patamona
            b. *Purucoto*[1] (*Porocoto*)
            c. *Arecuna*[2] (*Jaricuna*, *Pemon*): *Camaracoto*, *Taulipang*

[1] Loukotka (1939 a) distinguishes *Parukatu* from *Purukoto*.

[2] Nimuendajú lists an *Arawakan Arecuná* in the same region.

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[18] Loukotka distinguishes *Wayewe*, *Wayaway*, and *Vayamar*.

CARIB CLASSIFICATION—Continued

I. Northern—Continued
  - B. Central—Continued
    - 1. Roraima Group—Continued
      - d. *Arinagoto*
      - e. *Macushi* (*Macusi*): *Teweya*
      - f. *Waica*[3]
      - g. *Ingaricó*
      - h. *Sapará*
      - i. *Wayumará*
      - j. *Paraviyana*
      - k. *Kenóloco*
      - l. *Monoicó*
      - m. *Azumara*
      - n. *Paushiana*
      - o. *Mapoyo*
      - p. *Taparito*
    - 2. *Ventuari* Group
      - a. *Makiritare: Yecuaná* (*Mayongong*), *Maitsi, Ihuruaná, Decuaná* (*Wainungomo*), *Cunuaná*
      - b. *Yabarana: Curasicana, Wökiare*
  - C. Amazon
    - 1. Eastern
      - a. *Pianocotó*
      - b. *Apalai: Aracuayu*[4]
      - c. *Waiwai* (*Ouayeoné*)
      - d. *Pauxi*
      - e. *Trio*
      - f. *Diau*
      - g. *Shikiana* (*Chikena*)
      - h. *Tivericoto*
      - i. *Catawian* (*Parucutu*)
      - j. *Cumayena*
      - k. *Urucuena*
    - 2. Western
      - a. *Carijona* (*Umawa, Omagua*):[5] *Hianacoto, Guake, Tsahatsaha* (*Saha*), *Guagua, Riama* (?), *Caicushana, Mahotóyana, Yacaoyana* (?)
  - D. *Bonari*
    - 1. *Bonari*
    - 2. *Yauaperi* (*Crishaná*)
      - a. *Atroahy*
    - 3. *Waimiry*
    - 4. *Mutuan*

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[3] Distinguish from *Shirianán Waica*.

[4] Rivet (1924 a) believes that the *Apalai* are identical with the extinct *Aracuajú*, but the language of the latter seems to be mixed with *Tupi*, and Loukotka (1935) has put it in an independent subgroup for that reason.

[5] Distinguish from *Tupían Omagua*.

CARIB CLASSIFICATION—Continued

- II. Southern
  - A. South
    - 1. *Arara*
      - a. *Arara* (*Ajujure*)[6]
      - b. *Apiacá* (*Apingui*)[7]
      - c. *Pariri* (*Timirem*)
  - B. Xingú
    - 1. *Bacaïri*
    - 2. *Nahucua* (*Anauqua*)
      - a. *Guicurú* (*Cuicutl*)
      - b. *Apalakiri* (*Calapalo*)
      - c. *Mariape-Nahuqua*
      - d. *Naravute*
      - e. *Yarumá*
      - f. *Yamarikuma*
      - g. *Akuku*
- III. Northwestern
  - A. Maracaibo-Magdalena
    - 1. "*Motilones*"[8]
      - a. *Chaké: Macoa, Tucuco, Pariri, Chaké*
      - b. *Mapé: Macoa, Macoita, Manastara, Yasa, Chapara, Sicacao, Tucuco, Cunaguasata, Maraca, Aguas Blancas, Aricuaisá, Catatumbo, Irapeno*
      - c. *Carate*
      - d. *Zapara*[9]
    - 2. *Bubure* (*Coronado*)
    - 3. *Yarigui*
      - a. *Quiriquire* (*Kirikire*): *Topocoro, Topoyo, Chiracota, Araya, Guamaca, Tholomeo*
    - 4. *Opón*
    - 5. *Carare*[10]
      - a. *Colima* (*Tapas*): *Murca, Marpapi, Curipa*
      - b. *Naura*
      - c. *Nauracoto*
    - 6. *Muso* (*Muzo*)
    - 7. *Burede*
    - 8. *Guanao*
    - 9. *Pemeno*
    - 10. *Patagón*
    - 11. *Camaniba*

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[6] Distinguish between *Panoan*, *Chapacuran*, and *Cariban Arara*. Nimuendajú (Handbook, vol. 3, p. 214) states that the speech of the *Arara* is very close to that of the *Yarumá* (vide infra).

[7] Distinguish from *Tupian Apiacá* of the Tapajóz.

[8] *Motilón* classification according to Jahn, 1927, p. 80. Reichel-Dolmatoff (personal communication) states that the *Motilón* of Perijá, of Bolinder and de Booy, are pure *Cariban* of the *Chaima-Cumanagoto* group, but those of Catatumbo and Rio de Oro are very different and seem to be *Arawakan*, though the linguistic data are scarce.

[9] Hernández de Alba (Handbook, vol. 4, p. 469) calls *Zapara Cariban;* Rivet (1924 a) considers it *Arawakan*.

[10] Nimuendajú (map) leaves *Carare* unclassified. W. Schmidt (1926) places *Amarizano* in this Northwestern Group; most other authorities consider this language *Arawakan* (q. v.).

CARIB CLASSIFICATION—Continued

- B. *Chocoan*
  - 1. *Chocó*
    - a. North
      - *a. Empera: Funucuná, Dabeibe,*[11] *Urubá*
      - *b. Catío: Ibexico, Pequi, Norisco, Ituango, Teco, Peneco, Cararita, Cuisco, Araque, Pubio, Guacuseco, Tuin, Nitana, Pevere*
    - b. South
      - *a. Nonamá (Noanumá): Chanco*
  - 2. *Cenú*
    - a. *Nutabare (Nutabé): Tahamí*
    - b. *Cenufana*
  - 3. Cauca
    - a. *Quimbaya: Quimbaya, Carrapa, Picara, Paucura*
    - b. *Ancerma: Ancerma, Caramanta, Cartama, Nori, Guaca*
    - c. *Antioquia: Antioquia, Buritica, Corome, Evéjico*
    - d. *Arma: Arma, Pozo*
- C. Southwest
  - 1. *Gorrón*[11]
  - 2. *Buga*
  - 3. *Chanco*[11]
- D. Southeast
  - 1. *Arvi*
  - 2. *Patángoro (Palenque):*[12]
    - a. *Tamana*
    - b. *Guarino*
    - c. *Guagua*
    - d. *Zamana*
    - e. *Doyma*
  - 3. *Panche*
    - a. *Guazquia*
    - b. *Gualí*
    - c. *Marqueton*
  - 4. *Pijao*
    - a. *Quindio*
    - b. *Cutiba*
    - c. *Irico*
    - d. *Toche*
    - e. *Cacataima*

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[11] Rivet, 1943, excludes these from his *Chocó* group.

[12] Kirchhoff (Handbook, vol. 4, p. 339) groups *Amaní, Palenque, Zamaná, Punchina,* and *Marquesote* with *Patángoro,* and considers them of *Chibchan* relationship.

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Western Amazon.—Crévaux, Sagot, and Adam, 1882, pp. 35–38 (*Carijona*); Koch-Grünberg, 1906 c, p. 203 (*Carijona*), 1908 c, 1909 (*Hianacoto-Umaua*).

Bonari group.—Barboza-Rodríguez, 1885, pp. 247–260 (*Crishana*); Brinton, 1892 a, p. 44 (*Bonari*); Hübner, 1907, pp. 238–246 (*Yauaperi*); Payer, 1906, p. 222 (*Waimiry*); Pompeu Sobrinho, 1936 (*Mutuan*); Souza, A, 1916 a, pp. 77–78 (*Bonari*).

Arara group.—Coudreau, H., 1897 c, pp. 199–210 (*Arara*); Ehrenreich, 1888, 1894–95, pp. 168–176 (*Apingi*); Krause, 1936, pp. 39–41 (*Apingi*); Nimuendajú, 1914 b (*Pariri*), 1931–32, pp. 549–551 (*Arara*), 1932 a, pp. 116–119 (*Pariri*).

Xingú group.—Abreu, 1895, 1938 a (*Bacaïri*); Krause, 1936 (*Bacaïri, Nahucua, Yaruma*); Souza, A, 1916 b, pp. 71–73 (*Bacaïri*); Steinen, 1892, pp. 1–160 (*Bacaïri*), 1894, pp. 524–527 (*Nahucva*).

Northwestern group.—*Motilón-Macoa-Chake*: Bolinder, 1917, 1925; Booy, 1929; Ernst, 1887 b; Goeje, 1929–30; Isaacs, 1884, pp. 213–216; Jahn, 1927, pp. 340–354; Reichel-Dolmatoff, 1945 b (*Motilón*); Tavera-Acosta, 1921–22, pp. 221–230.

Jahn, 1927 (*Kirikire, Bubure*); Jiménez de la Espada, 1897, pp. 28–30 (*Patagón*); Lengerke, 1878 a (*Opón*), 1878 b (*Carare*); Oramas, 1918 a (*Kirikiro*).

LANGUAGES OF PROBABLE CARIBAN AFFILIATIONS

Naturally, *Cariban* relationships have been proposed for several other important linguistic groups and smaller languages by certain scholars, whose opinions have been accepted by some of their colleagues, rejected by others. Among these are the large *Chocoan* and *Peba-Yagua* groups, and the smaller languages *Yuma, Palmella, Yuri, Pimenteira,* and *Ochucayana.* For discussion of *Ochucayana* or *Tarairiú,* see "Small Unclassified Languages of the Pernambuco Region."

CHOCÓ AND CARIBAN OF COLOMBIA

Recent researches of Rivet (1943, 1944) and Jijón y Caamaño (1941–43) have advanced considerable evidence that many of the languages of Colombia formerly considered as *Chibchan* are (or were, since many of them are extinct) actually *Cariban.* These include *Chocó* and *Pijao.* They form a relatively solid group in northwestern Colombia, separated from the main mass of *Carib* in eastern Venezuela and Guiana by belts of *Arawakan* and *Chibchan* peoples paralleling the cordillera to the Caribbean Sea. Rivet divides these into Eastern (*Motilón,* etc.) and Western (*Chocó-Quimbaya*) groups, separated by the *Pijao-Panche-Patángora.* The *Cariban* affinities of *Motilón* (q. v.) have always been accepted. The *Carib* migration here is presumed to have been relatively late and to have supplanted former peoples of *Chibchan* speech.

The *Cariban* affinities of *Chocó* are apparently more obvious and generally accepted than those of the *Pijao-Panche-Patángoran,* and the *Quimbaya.* Hernández de Alba (Handbook, vol. 2, p. 922) places the *Pijao, Panche, Quimbaya,* and *Patángora* in the *Páez* subgroup, *Talamanca-Barbacoa* group of *Chibchan.* He also states (ibid., p. 923) that the "dialects of *Pijao, Páez, Timana,* and *Yalcón* were classed together." Reichel-Dolmatoff (personal communication) considers the *Cariban* relationship of *Chocó* (*Chami, Catio, Nonoama*) as proved, but is less convinced of those of *Pijao, Quimbaya,* and the other former inhabitants of the Magdalena and Cauca Valleys.

Cuna and *Chocó* are linked culturally and by inference linguistically in the Handbook (vol. 4, pp. 257–276).

Chocó has generally been considered an independent family (Brinton, 1891 a; Chamberlain, 1913 a; Loukotka, 1935; Pericot y García, 1936; Rivet, 1924 a; Ortíz, 1940 b). Mainly on account of the large number of *Chibcha* words, W. Lehmann (1920), followed by W. Schmidt (1926), believed it to be related to *Chibcha.* W. Lehmann (1920) thought it intermediate between the *Barbacoan* and the Central American groups of *Chibcha.* Jiménez Moreno (map, 1936) left it unclassified.

The various dialects seem to be slightly differentiated. *Chocó* has adopted a large number of words from *Chibcha* and, like many *Carib* languages, from *Arawak.*

Chocó languages or dialects mentioned by authorities, other than those given on the preceding chart, are *Citará*, *Andagueda*, *Bandó*, *Chamí*, and *Tadá* or *Tado*. *Cholo*, *Paparo*, and *Tucura* are placed by some in the *Citará* subgroup. Other groups mentioned by only one writer, Brinton (1891 a) in particular, are *Cañasgordas*, *Chiamu* (*Chocamu*), *Chochama*, *Murindo*, *Necodade*, *Pato*, *Río Verde*, and *Sambo*.

In the accompanying linguistic map the following groups appear in the area that is presumably Colombian *Carib*, probably *Chocó* or *Senú*: *Caramari*, *Fincenú*, *Guamoco*, *Malambo*, *Mompox*, *Pacabueye*, *Pancenú*, *Tamalamequi*, *Tolú*, *Turbaco*, *Yamicí*, *Zamba*, and *Zondagua*.

Other *Pijao* subtribes given by Rivet are *Aype*, *Paloma*, *Ambeina*, *Amoya*, *Tumbo*, *Coyaima*, *Poina* (*Yaporoge*), *Mayto* (*Maito*, *Marto*), *Mola*, *Atayma* (*Otaima*), *Tuamo*, *Bulira*, *Ocaima*, *Behuni* (*Beuni*, *Biuni*), *Ombecho*, *Anaitoma*, *Totumo*, *Natagaima*, *Pana* (*Pamao*), *Guarro*, *Hamay*, *Zeraco*, *Lucira*, and *Tonuro*.

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(All the important sources may be found in Reichel-Dolmatoff, 1945 a; Ortíz, 1940 b; W. Lehmann, 1920; Rivet, 1943–44.) Adelung and Vater, 1806–17; Anonymous, 1918 a (*Catio*); Bancroft, 1875; Bastian, 1876, 1878–89; Berendt, 1874 b; Beuchat and Rivet, 1910; Bollaert, 1860, pp. 65–67; Brinton, 1895 a (*Andagueda*), 1896 (*Noanama*); Cieza de León, 1881, p. 26 (*Arma, Pozo*); Collins, F., 1879; Cullen, 1851 a, 1868, 1875; Ernst, 1887 a; Greiffenstein, 1878 (*Chami*); Hurtado, G. O., 1924 (*Noanama*); Jijón y Caamaño, 1938, 1941–43; Latham, 1851; Lorenz, 1939 (*Catio*); Merizalde del Carmen, 1921, pp. 85, 89, 150; Mollien, 1824, 2:300, 1924, p. 450; Nordenskiöld, 1928 a, 1929 b; Pablo del Santísimo Sacramento, 1933; Pinart, 1887, 1897; Rivet, 1912 a, 1943–44; Robledo, 1922 (*Chami*); Röthlisberger, 1883–84; Saffray, 1872; Santa Teresa, 1924 (*Catio*); Seeman, 1853 (*Cholo*); Simon, 1887 (*Tucura*); Tessmann, 1930, pp. 472–475: Uribe, 1883; Uribe Angel, 1885, pp. 525–546; Vallejo, 1910 (*Baudo*); Velázquez, 1916 (*Chami*); Wassén, 1933, 1934 b, 1935; White, 1884 a, 1884 b.

PEBA-YAGUA

The classification of the *Yagua* or *Peba* group, generally agreed to consist of *Yagua*, *Peba*, and *Yameo*, has seen a recent return to belief in its independence. Hervás y Panduro (1800) had proposed a *Yamea* family, composed of *Amaono*, *Nahuapo*, *Napeano*, and *Masamae*. Brinton (1891 a) called the family *Peban*, the component languages *Caumari*, *Cauwachi*, *Pacaya*, *Peba*, and *Yagua*. Rivet (1911 b) then published his thesis that the group is affiliated with *Carib*; this opinion has been accepted in the classifications of Pericot y García (1936), Krickeberg (1922), W. Schmidt (1926), Simpson (1940), and Jijón y Caamaño (1941–43). Much earlier, however, Chamberlain (1913 a) decided that more proof of this relationship is needed, and continued the use of *Peban* as an independent family. The more recent authorities agree with this conclusion; Nimuendajú (map), Loukotka (1935) and Igualada and Castellví (1940) accord it independent family status, the first terming it *Peba*, the second *Yagua*. Métraux also doubts the *Carib* affinities. Loukotka (1935) calls *Yagua* (*Yegua*, *Yahua*) a "pure" language, *Peba* mixed with *Carib*, *Yameo* mixed with *Arawak* and *Carib*. Tessmann (1930) calls them both "mixed-stem languages," *Yagua* mixed *Pano-Carib*, *Yameo* mixed *Arawak-Pano; Peba* he seems to consider a synonym of *Yagua*. The group had best be left unclassified until further linguistic researches are made upon it.

A number of component languages and subdivisions of *Peba-Yagua* are mentioned in literature. Most of these are probably extinct, and the whole *Yameo* group is on the verge of extinction if not already gone.

A. *Yagua*
    1. *Yagua*
    2. *Peba*
        a. *Cauwachi*
        b. *Caumari*
        c. *Pacaya*
B. *Yameo*
    1. *Yameo*
        a. *Napeano*
        b. *Masamai*
        c. *Nahuapo*
        d. *Amaona*
        e. *Mikeano*
        f. *Parrano*
        g. *Yarrapo*
        h. *Alabono*
        i. *San Regino* (?)
        j. *Mazan* (?)
        k. *Camuchivo* (?)

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Peba-Yagua.—Castelnau, 1852, pp. 296–298; Chamberlain, 1910 a, pp. 195, 200–201; Fejos, 1943; Marcoy, 1867, pp. 131–132; Martius, 1867, 2:296–297, 300–301; Orton, 1871; Rivet, 1911 b, 1912 a; Tessmann, 1930, pp. 459, 577–580.

Yameo.—Adelung and Vater, 1806–17; González Suárez, 1904, pp. 67–68; Tessmann, 1930, p. 565.

ARDA

Arda was accepted as an independent linguistic family by all authorities from 1858 to 1924, including Rivet (1924 a) and Schmidt (1926). This opinion was based upon a Doctrina in a language of this name, the Lord's Prayer of which was published by Ludewig in 1858. This obviously bore no relationship whatever to any adjacent language. Paul Rivet (1925 e) examined the original manuscript in Madrid and found that it made no reference to the country in which *Arda* was spoken. Following some suspicions, he compared the words with modern *Dahomean* in Africa and determined their close relationship, especially to the *Popo* dialect. The text was evidently taken in the Slave Coast Kingdom of Arda, and the language has therefore no relation to that of the *Arda* tribe of southeastern Colombia, an extinct group probably related to the *Peba*, *Yagua*, and *Yameo*. Nimuendajú (map) continues to regard *Arda* as an isolated language.

Bibliography.—Chamberlain, 1910 a; Ludewig, 1858; Rivet, 1912 a, 1925 e.

YUMA

The *Yuma*, with one relatively large group and a small enclave in the state of Amazonas, are rather isolated from any other *Carib* groups. Accepted as of *Carib* affiliation by all other authorities, Nimuendajú leaves them unclassified, a conservative opinion herein followed.

PALMELLA

No authority, not even Nimuendajú, doubts the *Carib* affinity of *Palmella*, but as the linguistic data are very poor, as the *Palmella* are a tiny group, and far removed from any other *Carib* people, even much farther south than the doubtfully *Carib Yuma* (q. v.), they might well be left unclassified. If of *Carib* affiliation, they form the southwesternmost *Carib* group, near the Brazil-Bolivia border.

Bibliography.—Fonseca, J. S. da, 1880–81, pp. 193–196.

YURI (JURI)

Opinions regarding the relationship of the small *Yuri* (Chamberlain, 1913 a, and W. Schmidt, 1926, prefer the spelling *Juri*) group are very contradictory. Markham (1910) claimed a linguistic connection with the *Arawakan Passé*; Brinton (1891 a) accepted this classification. Loukotka (1935) and Igualada and Castellví (1940) consider it *Carib*. The more conservative recent opinions, Rivet (1924 a), Nimuendajú (map), W. Schmidt (1926), Tessmann (1930), Krickeberg (1922), follow Chamberlain's (1913 a) classification as independent or isolated. Possibly several *Jurí* or *Yurí* languages are here confused. Métraux (Handbook, vol. 3, p. 708) describes one as one of the "Arawakan tribes of the left middle Amazon." The data seem to be limited to the vocabulary in Martius (1867). There is apparently only one language, but there are said to have been 10 dialects. As the language is almost extinct, spoken today by a very few individuals, a modern grammar of *Yurí* is a great desideratum. It is a reasonable guess that if such a grammar is ever prepared, *Yurí* will be found to fall with either *Arawak* or with *Carib*. This *Yurí* must not be confused with an unclassified *Jurí* or *Surí* language of the Gran Chaco region.

Bibliography.—Cabrera, P., 1924; Chamberlain, 1910 a; Martius, 1867, 2:268–272; Rivet and Tastevin, 1921; Tessmann, 1930, p. 584; Wallace, 1853, pp. 528–529.

PIMENTEIRA

All the older standard authorities consider *Pimenteira* a *Cariban* language. Nimuendajú (map) places it with *Botocudo* (q. v.) and Lowie (Handbook, vol. 1, p. 381) calls it a separate family. It is far to the east of any other *Carib* group.

Bibliography.—Martius, 1867, 2:219–220.

MACRO-TUPÍ-GUARANIAN

A *Macro-Tupí-Guaraní* phylum is here diffidently proposed for the first time. It consists of *Tupí-Guaraní*, *Miranya* (*Bora*), *Witoto*, *Záparo*, and a number of less important languages which are generally placed in one or another of these "families." It is not advanced with any claim to certainty or with any evidence of proof, but as a result of opinions, deductions, and intuitions of the several authorities and of the present writer, plus the fact that there is great difference of opinion concerning into which of these families many of the small languages fall. Rivet (1911 a) has presented evidence for the inclusion of *Miranya* (*Bora*) in *Tupí-Guaraní*. This has been accepted by some, rejected by others. Dr. J. P. Harrington is convinced that *Witoto* also belongs with *Tupí-Guaraní*. Jijón y Caamaño (1941–43) establishes a *Witoto-Bora-Záparo* phylum separate from *Tupí-Guaraní*. *Záparo* is the most doubtful member of the phylum. Nimuendajú (map) and Loukotka (1935) keep all separate. As these families are contiguous a genetic connection is not unreasonable.

TUPÍ-GUARANIAN

Tupí-Guaraní, like *Arawak* and *Carib*, is one of the great widespread linguistic families of South America. The languages were, or are, spoken from easternmost Brazil to the foot of the Andes in Perú, and from Guiana to Uruguay. Though in many isolated groups, the bulk is in eastern Brazil. The distribution is mainly fluvial and maritime, most of the groups restricted to the coast or the river valleys. The original home seems to have been in the region of the Paraguay-Paraná, from which they spread, following the rivers. Soon after the time of the Conquest they held the entire Brazilian coast from the Amazon nearly to Buenos Aires. Much of this migration was recent and probably even post-Conquest, and largely during the sixteenth century. Other migrations up to and including the present century are of historical record. (See Métraux, Handbook, vol. 3, pp. 97–99.) Many of these migrations were at the expense of *Ge* groups, especially on the Brazilian coast. The distribution of languages at the time of the Conquest is, therefore, most difficult to determine; branches of the same group, sometimes bearing the same or similar names, are found in very widely separated regions, and present geographical propinquity carries no presumption of close linguistic relationship. Tribes of other linguistic affinities frequently adopted *Tupí-Guaraní* tongues, especially after the Conquest. Northern *Tupí*, *Tupí* Proper or *Nhengatu*, was adopted by the Spanish missionaries and traders as the lingua geral, which aided its spread and vogue. The use was probably largely due to the fact that it is said to be a relatively simple language morphologically, and easy to learn.

Though *Tupí-Guaraní* may eventually form the body of one of the great phyla into which South American languages may be grouped, it is unlikely that it will be found to be related to any of the other major families.

No documented study of the divisions of *Tupí-Guaraní* on a linguistic basis has ever been made. Rivet (1924 a) lists them geographically. W. Schmidt (1926) and Loukotka (1935) group them into subdivisions with geographic terminologies, but with great mutual disagreement, since many isolated intermediate groups may be placed in any one of several subdivisions. The present classification is based on all of them, modified by opinions of more recent observers regarding the relationship of certain groups. It makes no claim to correctness or finality, and will doubtless be modified greatly by future researches. The two main divisions are into *Tupí* and *Guaraní*, but, even in these, apparently the relationship is relatively not very distant.

TUPÍ-GUARANÍ CLASSIFICATION

I. *Guaraní*
    A. Paraná
        1. *Guaraní* (*Carijó*, *Carió*, *Chandule*)
            a. *Arechane*, *Itatín*, *Tapé*, *Tobatine*, *Guarambaré*, *Taioba*
        2. *Cainguá* (*Kaiguá*, *Montese*)
            a. *Apapocuva*, *Cainguá*, *Carima*, *Chiripá*, *Guayaná*,[1] *Mbya*[2] (*Mbühá*, *Apiteré*, *Baticola*, *Boaberá*), *Oguana* (*Oguaiuva*), *Pañ'*, *Tanyguá*, *Tarumá*,[3] *Cheiru*, *Avahuguái*, *Paiguaçu*, *Yvytyiguá*, *Avachiripá*, *Catanduva Jatahy*
        3. *Paranaé*
        4. *Guayakí*[4]
        5. *Aré* (*Setá*, *Ivaparé*, *Shocleng*, *Notobotocudo*,[5] *Pihtadyovac*)

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[1] Métraux (Handbook, vol. 3, p. 69) uses *Cainguá* to distinguish the modern primitive from the civilized *Guaraní*. Distinguish from two other *Guayaná* in the same general region, one *Ge* and one unclassified, according to Nimuendajú (map). (See Métraux, Handbook, vol. 3, pp. 70–71.)

[2] Distinguish from *Guaicurú Mbayá*.

[3] Distinguish from *Arawak* (?) *Tarumá*.

[4] Closely related to *Guaraní* linguistically, according to Métraux and Baldus (Handbook, vol. 1, p. 435). Most modern authorities agree, but a few consider it independent or refuse to classify it.

[5] The *Aré* or *Setá* are erroneously called *Botocudo* or *Notobotocudo*, but have no connection with *Botocudo* proper (*Macro-Ge*).

Tupí-Guaraní Classification—Continued

- I. *Guaraní*—Continued
  - B. Bolivia
    - 1. *Chiriguano* (*Aba*, *Camba*, *Tembeta*)
      - a. *Guarayú*
        - a. *Pauserna: Itatín, Carabere, Araibayba, Moterequoa* (*Moperacoa*), *Varai, Pirataguari* (*Pitaquari*), *Cario, Kiriticoci, Guarayú-Tá*
      - b. *Sirionó* [6] (*Chori*)
        - a. *Nyeoze-Née, Tirinié, Jandé, Qurungúa*
    - 2. *Torá* [7]
    - 3. *Porokicoa*
    - 4. *Palmares* (?) [8]
    - 5. *Tapieté* [9] (*Tirumbae*)
      - a. *Yana* (*Yanaigua*)
    - 6. *Ubegua* (?) [10]
    - 7. *Chané* [11]
  - C. Araguaya [12]
    - 1. *Tapirapé* [13]
    - 2. *Canoeiro* (*Avá*)
- II. *Tupí*
  - A. Coastal (*Nyeengatu*)
    - 1. *Tupina* (*Tupiguae*)
      - a. *Aricobé, Amoipira*
    - 2. *Tupinamba*
      - a. *Apigapigtanga, Araboyara, Caeté* (*Cahetê*), *Guaracaio* (*Itati*), *Muriapigtanga, Potiguara* (*Pitonara*), *Rariguara, Tamoyó, Timimino, Tabayara,*[14] *Tupinikin, Viatan-Pernambuco*
  - B. Guiana
    - 1. *Apoto* (*Aponto*)
    - 2. *Calianá* [15]
    - 3. *Oyampí*
      - a. *Camacom*
    - 4. *Wayapi* (*Guayapi*)
    - 5. *Emerillon*
    - 6. *Paikipiranga* (*Parichy*)

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[6] The former language of the *Sirionó* is unknown.

[7] A number of the tribes mentioned below have adopted *Guaraní* in recent centuries. *Torá* was formerly classified as *Chapacuran;* a large vocabulary gathered by Nimuendajú shows beyond doubt that it is impure *Tupí* (Nimuendajú, 1925; Nimuendajú and Valle Bentes, 1923).

[8] *Palmares* and *Ubegua* were placed by Brinton (1898 a) among the *Guaraní* groups of the Gran Chaco; other authorities do not mention them.

[9] The former language of the *Tapieté* may have been *Arawak.*

[10] See footnote 9.

[11] The *Chané* (q. v.) formerly spoke *Arawak.*

[12] These two groups (*Tapirapé, Canoeiro*) apparently migrated here from the south in historical times. Both are slightly known. The *Canoeiro* are said to be descendants of the *Carijó* (*Guaraní*). Lipkind (personal communication) thinks that they may not be extinct, and may not be *Tupí.*

[13] Wagley (personal letter) says that the *Tapirapé* language resembles *Guaraní* more than northern *Tupí* in its use of specific pronominal prefixes, suffixes of time, place, and condition, and in high development of nasalization.

[14] See Métraux, Handbook, vol. 3, page 96.

[15] Distinguish from independent *Caliána* (q. v.).

Tupí-Guaraní Classification—Continued

- II. *Tupí*—Continued
  - B. Guiana—Continued
    - 7. *Cusarí* [16]
    - 8. *Wara-Guaju* (*Araguajú*) [17] (*?*)
  - C. Southern Amazon
    - 1. Araguaya Division (*He*-group)
      - a. *Nyengahiba*
      - b. *Ararandewara*
      - c. *Miranyo* (*?*) [18]
      - d. *Amanayé* (*Manazo*): *Anambé, Paracanã*
      - e. *Tenetéhara:*[19] *Guajajára, Tembé, Guajá*
      - f. *Urubú*: *Turiwara* (*Turuara*)
      - g. *Pacajá*: *Pacajá, Jacundá* (*Amiranha?*), *Anta* (*Tapiraua*)
      - h. *Cubenepre*: *Kupé-rób* (*Jandiahí*)
      - i. *Asuriní* (*?*) [20]
    - 2. Xingú Division
      - a. *Yuruna* Group [21]
        - *a. Yuruna*: *Yuruna, Shipaya* (*Ashipaye*)
        - *b. Manitsawá*
        - *c. Arupaí* (*Urupaya*) [22]
      - b. *Tacunyapé* (*Pewa*)
      - c. Upper Xingú Group
        - *a. Auetö*: *Arawiti* [23]
        - *b. Arawine*
    - 3. Tapajóz Division
      - a. *Cawahíb* Group
        - *a. Cabahyba: Cawahíb,*[24] *Parintintin, Apairande, Odyahuibe*
      - b. *Apiacá* [25]
        - *a. Tapanyuna* (*Arino*)
      - c. *Mundurucú* [26]
        - *a. Curuaya* (*Kuruahe*)

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[16] Probably originally *Carib*, acculturated to *Tupí*, according to Gillin (Handbook, vol. 3, p. 814). Subtribe of *Oyampí*, according to Rivet (1924 a). Nimuendajú (map) leaves *Kussarí* unclassified.

[17] Nimuendajú (map) distinguishes two groups of *Aracajú* in this region, a *Carib* group on the Rio Paru and an unclassified group on the Rio Pacaja. (See also Nimuendajú, Handbook, vol. 3, p. 209.)

[18] See Nimuendajú, Handbook, vol. 3, page 208.

[19] According to Wagley (personal correspondence), the *Guajajára* and *Tembé* form one tribe and call themselves *Tenetéhara*. The *Guajá* are neighbors of the *Guajajára* who say that they speak "our" language *Urubú* is grammatically like *Guajajára*, with a slight phonetic difference governed by regular sound shifts.

[20] Nimuendajú (Handbook, vol. 3, p. 214) says that *Asuriní* is reported to be like *Guajajára;* as there is no record of the speech, most of the other authorities who have mentioned the language have left it unclassified.

[21] According to Nimuendajú (Handbook, vol. 3, p. 214), *Yuruna, Shipaya,* and *Manitsawá* form a group of impure *Tupí*, to which *Arupaí* may also belong. It differs considerably from *Tupí* proper by reason of *Arawak* and *Carib* influences. *Yuruna* and *Shipaya* are almost mutually intelligible, differing by regular sound shifts. Martius (1867) and Adam (1896) doubt the *Tupí* relationship generally accepted. Loukotka (1935) considers *Manitsawá* as mixed with *Ge; Yuruna* and *Shipaya* as mixed with *Arawak*. Lévi-Strauss (Handbook, vol. 3, p. 322) says that *Manitsawá* includes much from *Suya* (*Ge*).

[22] Distinguish *Arupaí* from *Gurupá* of Tocantins, and from *Urupá* of Gy-Parana.

[23] *Arawiti* is a mixture of *Aweto* and *Yawalapiti*, according to Lévi-Strauss (Handbook, vol. 3, p. 322).

[24] Lévi-Strauss has a large unpublished vocabulary of *Cawahíb*. *Cawahíb* and *Parintintin* are very similar and both have strong affinities with *Apiacá*. They are remnants of the ancient *Cabahyba* (Nimuendajú, Handbook, vol. 3, p. 283).

[25] See Nimuendajú, Handbook, vol. 3, page 313.

[26] According to Loukotka (1935, 1939 a), *Mundurucú* and *Kuruaya* are mixed with *Arawak*, *Maué* mixed with *Carib* and *Arawak*. Nimuendajú (Handbook, vol. 3, p. 246) says that *Maué* contains non-*Tupí* elements that cannot be traced to any other linguistic family.

Tupí-Guaraní Classification—Continued

- II. *Tupí*—Continued
  - C. Southern Amazon—Continued
    - 3. Tapajóz Division—Continued
      - d. *Maué* [26]
      - e. *Wirafed*
      - f. *Cayabí:* [27] *Camayurá*
      - g. *Tupinambarana*
      - h. *Paranawát*
      - i. *Ramarama* (*Itanga*) [28]
        - *a. Itogapuc* (*Ntogapid*)
      - j. *Catukinarú*
  - D. Upper Amazon
    - 1. *Cocama* Group [29]
      - a. *Cocama: Cocamilla, Xibitaona*
      - b. *Omagua* (*Campeva*)
    - 2. *Aizuare* Group [30]
      - a. *Aysuari: Curuzicari*
      - b. *Bonama* (*Ibanoma*)
      - c. *Pawana*
      - d. *Soliman* (*Yoriman*)

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[26] For footnote 26, see page 239.

[27] Rivet considers *Cayabí* as *Carib.* (See Nimuendajú, Handbook, vol. 3, p. 307.)

[28] *Ramarama* and *Ntogapid* are mixed with *Arawak* and *Arikem*, according to Loukotka (1935, 1939 a).

[29] *Cocama* and *Omagua* are not mutually intelligible; they also speak *Quechua* and Spanish. *Cocamilla* is the southern or Ucayali dialect of *Cocama*, the difference negligible.

[30] These languages are all extinct. Nimuendajú (map) leaves the first three, the only ones there listed, unclassified; he considers *Curacicari* a synonym of *Aysuari.*

Nimuendajú lists a number of groups under the *Tupí* designation that are not found in the above outline. Some of these may be synonyms; a few others are put in other families by other authorities, or left unclassified. Most of these are in the southern Amazon region. Of these languages, found in a prevailingly *Tupí* region, the following are left unclassified by Handbook authors for lack of sufficient information: *Amniapé, Guaratagaja, Kepkiriwat, Macurap, Tuparí, Arikem* (q. v., infra), and *Buruburá* (*Puruborá*, generally considered *Huari* or independent).

Others in this general region, considered *Tupí* by Nimuendajú, are: *Aruá, Guaráyo, Ipotwat, Jabotifed, Mialat, Paranawat, Sanamaica, Taipö-shishi, Takwatib, Tucumafed,* and *Wayoró.*

YURIMAGUA (ZURIMAGUA)

Yurimagua is generally considered *Tupian;* Métraux (Handbook, vol. 3, p. 704) gives his evidence for believing that it is not related to *Omagua* and possibly independent; Nimuendajú leaves it unclassified.

ARIKEM

Though generally placed in the *Chapacuran* family, Loukotka (1935, 1939 a,) considers the *Arikem* (*Ariqueme, Arikême, Arikeni,* *Ahôpovo*) language sufficiently distinct to form a separate family, with intrusions of *Tupí* and *Arawak.* Nimuendajú (map) classifies it under *Tupí,* and Métraux (Handbook, vol. 3, p. 406) believes that he (Nimuendajú) has proved the *Tupian* relationship.

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MIRANYAN OR BORAN

Synonyms: *Miranhan, Miraña, Bora, Boro.*

Not recognized by Brinton's (1891 a) classification, *Miranyan* was first proposed as a separate family by Chamberlain (1913 a), on the basis of publications by Mochi (1902–03), Koch-Grünberg (1906 c, 1909–10), and Rivet (1911 a). Although Rivet had already published his study with his conclusion that *Miranya* is a very much modified and differentiated *Tupí-Guaraní* dialect, Chamberlain, with the comment that "more evidence is needed," preferred to leave it unaffiliated with any other large group. Krickeberg (1922) and Pericot y García (1936) accept Rivet's classification; Loukotka (1935) and Igualada and Castellví (1940), preferring to call the family *Bora,* class it as independent. W. Schmidt (1926) outlines the problem and begs the question. Tessmann (1930) calls it a mixture of *Ge-Tupí;* Nimuendajú (map) considers it independent. Steward (Handbook, vol. 3, p. 749), considers it under *Witotoan,* which latter he accepts as Tupian. Jijón y Caamaño (1941–43) makes it a member of his phylum *Witoto-Bora-Záparo,* distinct from *Tupí.*

A grammar of some *Miranyan* language is a great desideratum; the data available for comparison are purely lexical. While the evidence of *Tupí* relationship presented by Rivet (1911 a) is not entirely convincing—witness its nonacceptance by many authorities—it is nonetheless highly probable and is herein accepted. Dr. J. P. Harrington has made an independent comparison and is convinced of the relationship. *Miranya* seems to be most closely related to *Witoto,* and several languages, such as *Muinane, Coeruna, Nonuya,* and *Imihita,* are placed by some under *Miranya,* by others under *Witoto.* Harrington's conclusions (personal communication) are:

> The Witotoan probably includes Miranya and is certainly an outlying member of Tupí-Guaraní. Miranya and Witoto are distantly related and both are related to Tupí. The Tupí affinity is not one of admixture. Miranya shares a very considerable number of etyma with both Tupí-Guaraní and Witoto. The percentage is larger than Rivet thought and extends to fundamental words.

Rivet (1911 a) believes that *Miranya* is the northwesternmost of the *Tupí-Guaraní* languages, the remains of a very early invasion, before that of the not-far-distant and more purely *Tupí* languages such as *Omagua* and *Cocama,* and, therefore, more affected by borrowings from adjacent languages. The same remarks would doubtless apply to *Witoto,* and possibly even to *Záparo.*

There is great difference of opinion regarding the component languages of the *Miranya-Bora* group. Igualada and Castellví (1940) subdivide the *Bora* into the True *Bora* (*Bora, Miraña*), and the False

Bora (*Imihita, Nonuya-Bora, Muinane-Bora*); these last languages are considered *Witotoan* by several authorities. Tessmann (1930) lists 20 bands, Whiffen (1915) 41. Harrington (personal communication) says that Koch-Grünberg's *Imihita* words are typically *Miranyan*, controverting Igualada's and Castellví's (1940) opinion of them as "false." Koch-Grünberg (1906 a) gives four *Miranya* languages: *Imihita, Fã-ãi, Miranya,* and *Miranya-Oirá-Açu-Tapuya.* Martius' (1867) "*Hawk*" and "*Mosquito*" vocabularies are also *Miranyan*, according to Harrington (personal communication). *Orejón* and *Coeruna* have also been considered as *Miranyan* languages. Martius' (1867) *Miranya-Carapana-Tapuya* vocabulary is apparently closer to *Witoto.*

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WITOTOAN

Though the independent position of *Witoto* has not to date been abandoned, certain languages—for instance, *Nonuya, Minuane, Ocaina,* and *Miranya-Carapana-Tapuyo*—have been placed by some authorities in the *Witoto* family, by others in *Miranya* or *Tupí-Guaraní*, suggesting possible relationship with the latter. It was originally believed to be *Cariban.* Dr. J. P. Harrington has compared *Witoto, Cocama,* proved. Ortíz (1942) does not accept the relationship to *Bora Miranya*, and *Tupí-Guaraní*, and is convinced of the relationship of all. Dr. Harrington's unpublished treatise indicates a general resemblance in morphological type, and close resemblance of morphological elements in position, meaning, and phonetic type; the lexical relationship, as presented, is not so convincing. The relationship of *Witoto* to *Tupí-Guaraní* is accepted herein, though not as incontrovertibly proved. Ortíz (1942) does not accept the relationship to *Bora* (*Miranya*) but Jijón y Caamaño (1941–43) makes it a member of his *Witoto-Bora-Záparo* phylum.

The native name for the language is *Komiuveido.* Castellví (1934 b) believes that the historical *Quiyoya* were the ancestors of the *Witoto;* Ortíz (1942) thinks they were the *Cambeba* or *Omagua* (*Cafuane*). *Orellado* and *Orelludo* are probably synonyms for *Orejón;* their language was known as *Mativitana.*

No methodical attempt seems to have been made to subdivide *Witoto* on a linguistic basis. There seems to be a group of true or proper *Witoto*, and one more closely related to *Miranya.* The classification of Ortíz (1942) is adopted as the basis herein. The *Miranya-Carapana-Tapuyo* vocabulary of Martius (1867) is *Witotoan.*

Pinell (1928) mentioned 136 *Witoto* subdivisions, Tessmann (1930) 50–60, Ortíz (1942) 39, Farabee (1922) 16. Probably each of these had its particular dialect or variety; Pericot y García (1936) copies Farabee's subdivisions, names not mentioned, except as synonyms, in the classificatory table.

The several authorities quoted, especially Ortíz (1942), mention a number of *Witoto* groups in addition to those given above, without indicating their relationships with other groups. Those that are not synonyms probably each has or had its own dialect. Among these are: *Aefuye, Aipui, Ajayú, Bodyánisai, Gayafeno, Emenani, Eraye, Fayagene, Fusigene, Gibuñe, Idekofo, Itchibuyene, Jetuye, Jidua, Joyone, Kanieni, Kotuene, Meresiene, Mobenidza, Nequerene, Nofuiqüe, Orotuya, Uitoto Piedra, Uiyókoe, Yane, Yari* (*Jómane, Neimade*), *Yusigene*, and *Yauyane*.

WITOTO[1]

I. *Witoto*
    A. *Witoto*
        1. *Witoto*
            a. *Kaime* (*Caimo*)
            b. *Xúra*
            c. *Séueni*
            d. *Jayruya*
            e. *Mekka: Yaboyano*
            f. *Menekka*
            g. *Búe*
            h. *Ifikuene-Caimito* (?)
    B. *Miranyan, Boran*
        1. *Miranya-Carapana-Tapuyo*
        2. *Nonuya* (*Achiote*)[2]
        3. *Ocaina-Muenane*
            a. *Ocaina* (*Ducaiya*); *Fitita* (?)[2]
            b. *Muenane*[2]
    C. Southeastern
        1. *Orejón*[2]
        2. *Coeruna* (?)[2]
    D. *Andoke* (?)[2]
        1. North
            a. *Araracuara*
        2. South
    E. *Resigero* (?)[2]

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[1] This classification is exceedingly and unusually controversial and uncertain.

[2] See independent short articles on these.

NONUYA

Nonuya is considered a *Witotoan* language by Nimuendajú (map). Tessmann (1930) leaves it as unknown or independent. Loukotka (1935) places it, with *Muenane*, in his *Bora* (*Miranya*) family.

MUENANE

Steward (Handbook, vol. 3. p. 750) treats *Muenane* under *Witoto*. Nimuendajú (map) omits it. Few writers have mentioned them (Whiffen, 1915; Preuss, 1921–23). Loukotka (1935) places it under his *Bora* family (see *Miranya*), with *Tupí* intrusion and vestiges of *Witoto*. Tessmann (1930) gives a vocabulary of 38 words from which, by his comparative method, he deduces that it is a mixture of *Ge* and *Carib*, a doubtful conclusion. They should be considered as unclassified.

FITITA

Steward (Handbook, vol. 3, p. 750) treats the *Fitita* culturally under *Witotoan*, possibly a subdivision of *Ocaina;* the linguistic evidence has not been presented. Nimuendajú leaves them unclassified, a decision herein accepted. Tessmann (1930) could find almost no information on them and no clue to their linguistic affiliation.

OREJÓN

The Spanish word "orejón," "big ears," was applied to native groups that wore large earplugs, distending the lobes, and, therefore, is applicable to several unrelated linguistic groups. The more important of these are in the *Witoto-Tucano* region. Here, the name seems to be applied to two adjacent groups, resulting in inevitable confusion. One group, apparently known by no other synonym, is southern *Witoto* and apparently extinct. Another tribe known as *Orejón* is the *Coto* (q. v.), which is generally agreed to be of *Tucano* linguistic affinity.

COERUNA

Though grouped with *Witoto* by all other authorities, including Rivet (1924 a) and Nimuendajú (map and index), *Coeruna* seems to be so different lexically that Loukotka (1935) makes it an independent family (with *Witoto* and *Tucano* intrusions). Apparently extinct, the lexical data seem restricted to the old vocabulary in Martius (1867). It is most often linked with *Orejón.*

ANDOKE

Tessmann (1930), Castellví (1934 b), and Igualada and Castellví (1940) from first-hand acquaintance with the language of the *Andoke* consider it independent or of unknown affiliations. Rivet (1924 a) places it in the *Witoto* family and thinks that it may be identical with *Miranya-Carapana-Tapuyo* and *Nonuya.* Steward herein accepts it as *Witotoan,* but of unknown subclassification. Ortíz (1942) does not accept the *Witoto* relationship. Most of the other authorities do not mention it. Dr. J. P. Harrington (personal correspondence) believes in the affiliation with *Witoto*. Though in the southern Colombian forests, it is not far distant from the extinct *Andakí* of the southern Colombian Highlands with which it is liable to be confused.

RESIGERO

The position and affiliations of *Resigero* are most uncertain. Tessmann (1930) thinks it may be *Bora* (*Miranya*); Loukotka does not seem to mention it. Nimuendajú (map) leaves it unclassified. Igualada and Castellví (1940) believe it related to *Arawak*. Ortíz (1942) doubts the *Witoto* relationship.

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Nonuya.—Tessmann, 1930, pp. 583, 617.

Muenane.—Ortíz, 1942; Tessmann, 1930, pp. 329–337; Preuss, 1921–23; Whiffen, 1915.

Fitita.—Ortíz, 1942; Tessmann, 1930, pp. 583, 617; Whiffen, 1915.

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Coeruna.—Martius, 1867, 2:273–275.

Andoke.—Castellví, 1934 b; Igualada and Castellví, 1940; Ortíz, 1942; Tessmann, 1930, pp. 584, 617.

Resigero.—Igualada and Castellví, 1940; Ortíz, 1942; Tessmann, 1930, pp. 583, 617.

ZÁPAROAN

Záparoan is an important group that has been accepted as an independent family in all the major classifications since the earliest. However, while yet to be proved, it is not unlikely that it will be found to be related to *Witoto*, *Miranya*, and *Tupí-Guaraní*, and it is tentatively accepted herein as a member of the *Macro-Tupí-Guaraní* phylum. Rivet (1911 a) noted a large number of related words in these four languages and suggested the possibility of relationship but withheld final opinion. The most recent writer, Ortíz (1940 a), also continues to grant it independence, but Jijón y Caamaño, in his 1941–43 classification, makes a *Witoto-Bora-Záparo* phylum, distinct from *Tupí-Guaraní*. Loukotka (1935) finds a "Tupí intrusion" and Tessmann (1930) considers the *Záparo* language a *Carib-Tupí* mixture.

The linguistic data on *Záparoan* are very deficient, consisting of a few short vocabularies on a half dozen of the many component languages, and a few short translated religious prayers. Almost nothing is known of the grammar and only a few points were deduced by Beuchat and Rivet (1908). The grammar is, probably mistakenly, said to be simple, the phonetics nasal and guttural, though the effect is "agreeable." There are said to be pronominal possessive prefixes, pluralizing suffixes and pronominal "case" suffixes.

The classification of the component languages and dialects of the *Záparoan* family is in utter confusion; no attempt has ever been made to do this on a scientific linguistic basis, and the available data are insufficient. Most compilers have merely given a list of names of groups, many of them geographical, and such suggestions as are made are based mainly on travelers' published remarks regarding linguistic relationships. These, as well as the deductions based upon them, are highly equivocal and contradictory.

The earliest authorities, Velasco (1840) and Hervás y Panduro (1800), were in practical agreement on three main divisions of the *Záparoans* proper (excluding the *Iquito*, not included by Hervás), and on the dialects composing these:

- *Andoa:*
  - *Araro* (H.)
  - *Bobonazo* H.)
  - *Chudaviña* or *Chuudaviño*
  - *Frascavina* (V.)
  - *Gae* (H.)
  - *Guazaga* or *Guazago*
  - *Macavina* (V.)
  - *Murata* or *Murato*
  - *Pava* or *Pabo*
  - *Pinche*
  - *Quirivina* (V.)
  - *Semigae* (H.)
- *Simigae* of Curaray (Velasco); *Simigaecurari* (Hervás):
  - *Araza* or *Arazo*
  - *Ginori* (V.)
  - *Iginori* or *Ijinori*
  - *Incuri* (V.)
  - *Napotoa* (V.)
  - *Nepa* or *Nevo*
  - *Oa*
  - *Ynúri* (V.)
  - *Zapa*
  - *Zapara* or *Zaparro*
- *Simigae* of Tigre (Velasco); *Jinori* (Hervás):
  - *Acamori* or *Acamaori*
  - *Comacori*
  - *Conejori* (V.)
  - *Iqueconejori*
  - *Itremojori* (V.)
  - *Panajori*
  - *Tremojori*

Velasco divided the *Iquito* into two groups:

- *Iquito* of Tigre:
  - *Aicore*
  - *Ayacore*
  - *Eriteyne*
  - *Himuetaca*
  - *Neracamue*
- *Iquito* of Nanay:
  - *Blanco*
  - *Huasimoa*

Most of these groups are not mentioned, and probably are extinct or amalgamated today, as well as the dozens of small groups listed by other writers (Brinton, 1891 a, listed 62). No recent compiler has attempted to classify these small groups, but Rivet (1924 a), Pericot y García (1936), and W. Schmidt (1926) recognize five main subdivisions; Loukotka (1935), four, which more or less agree with the earlier divisions:

Andoa
Conambo (*Combo*)
Gae (not accepted by Loukotka)
Iquito (*Ikito*)
Záparo

Ortíz (1940 a) gives the main dialects as *Gae, Semigae, Iguito, Iginorri,* and *Panocarri.*

Tessmann (1930) considers the *Iquito* independent, divided into two groups, the *Iquito* or *Iquito* Proper and the *Cahuarano* or *Kawarano;* he calls it a mixed *Tukano-Pano* language. Steward and Métraux (Handbook, vol. 3, p. 636) believe that this is erroneous, that the *Iquito* language is very similar to *Gae,* and that Tessmann's *Cahuarano* may be *Maracano.* Nimuendajú (map) places *Iquito* as *Záparoan.* Tessmann believes the *Gae* to be strongly *Carib:* he calls the *Záparo Carib-Tupí* and the *Andoa Carib-Ge.* He also considers the *Murato* to be a *Candoshi* (*Maina*) subtribe.

According to other evidence (Handbook, vol. 3, p. 634), the *Coronado* were kinsmen of the *Oa* and must be distinguished from the totally unrelated (*Tucano*?) *Coronado* on the Aguarico River. "*Auca*" is the generic name for "pagan." *Andoa, Gae,* and *Semigae* are closely related, but *Andoa* and *Semigae* are not synonymous, as Tessmann thought. The vocabulary supposed to be *Murato* (Anonymous, 1928 b) has no resemblance to *Záparoan. Soronotoa* may be a synonym for *Semigae;* the latter is very similar to *Andoan Murato.* Many of the *Roamaina* and *Záparo* also speak *Quechua. Comacor* may be a subtribe of *Semigae,* of *Roamaina,* a synonym for *Iquito,* or a distinct tribe. Of doubtful affiliation with *Záparo* are *Aunale, Alabano, Curizeta, Sucumbio,* and *Neva.*

Steward and Métraux (Handbook, vol. 3, p. 634) make a *Roamaina* group of *Záparoan,* apparently including *Pinche, Zapa, Pava, Arazo,* and some subsidiary languages. *Roamaina* is generally placed with *Omurano* (q. v.), whose affiliations are so disputed that it probably should be considered unclassified.

Tiputini (*Tiwacuna*) and *Chiripuno* are considered by Tessmann (1930) and Loukotka (1935) as languages akin to *Sabela* (q. v.), to which Loukotka accords independent status.

ZÁPARO

I. *Coronado* Group
    A. *Coronado* (*Ipapiza, Hichachapa, Kilinina*)[1]
        1. *Tarokeo*
        2. *Chudavina* (?)
        3. *Miscuara* (?)
    B. *Oa* (*Oaki, Deguaca, Santa Rosina*)
II. *Andoa* Group
    A. *Andoa*
        1. *Guallpayo*
        2. *Guasaga*
        3. *Murato*[2]

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[1] Beuchat and Rivet, 1909, classified the *Coronado* as *Cahuapanan.*

[2] See separate article, *Candoshi* and *Murato.*

ZÁPARO—Continued

- II. *Andoa* Group—Continued
  - B. *Gae* (*Siaviri*)
  - C. *Semigae*
    - 1. *Aracohor*
    - 2. *Mocosiohor*
    - 3. *Usicohor*
    - 4. *Ichocomohor*
    - 5. *Itoromohor*
    - 6. *Maithiore*
    - 7. *Comacor* (?)
  - D. *Iquito* (*Amacacora, Kiturran, Puca-Uma*)
    - 1. *Iquito*
    - 2. *Maracana* (*Cawarano* ?)
    - 3. *Auve*
  - E. *Asaruntoa* (?)
- III. *Záparo* Group
  - A. *Záparo*
    - 1. *Muegano*
    - 2. *Curaray*
    - 3. *Matagen*
    - 4. *Yasuni*
    - 5. *Manta*
    - 6. *Nushino*
    - 7. *Rotuno*
    - 8. *Supinu*

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Andoa.—Brinton, 1898 b; Tessmann, 1930. pp. 530, 617.

Semigae.—Anonymous, 1930 b; León, A. M., 1930 b; Tessmann, 1930. p. 534.

Iquito.—Castelnau, 1852, pp. 295–296; Gonzáles Suárez, 1904, pp. 69–74; Martius, 1867, 2: 302; Tessmann, 1930, pp. 512, 617.

OMURANO (ROAMAINA?)

Synonyms: *Numurana, Hunurana, Roamayna* (?).

Tessmann (1930) gives an *Omurano* vocabulary of about 250 words, large enough for Loukotka (1935) to decide to give it a position as an independent family consisting of *Omurana* (with vestiges of *Chimu*) and the extinct *Maina.* To Tessmann it is a mixture of *Arawak* and *Carib*, rather strongly *Arawak.* He identifies them with the historical *Roamaina* (*Roamayna*). Brinton (1891 a) classifies *Humurano* (evidently the same as *Hunurana*) and *Roamaina* as belonging to the *Maina;* this classification follows Hervás. The *Maina* stock of Hervás y Panduro (1800), Brinton (1891 a) and Chamberlain (1913 a) is the modern *Cahuapana* (q. v.), and Beuchat and Rivet (1909) classified *Roamaina* as *Cahuapanan*. Loukotka (1935) seems to have found little *Cahuapana* resemblance in *Omurana.*

Steward and Métraux (Handbook, vol. 3, p. 634) consider the Roamaina as a division of Záparoan (q. v.) and to be totally distinct from the *Maina*. It is believed to be represented by the extinct *Zapa,* and today by the *Pinche,* with the dialects *Pava, Arasa, Uspa* or *Llepa,* and *Habitoa.* (See Steward and Métraux, Handbook, vol. 3, p. 634.) With such difference of opinion, *Roamaina-Omurano* and *Pinche* had best be considered as unclassified.

Bibliography.—Tessmann, 1930, pp. 444 (*Omurana*), 582 (*Pinche*).

SABELA

Sabela is a new group, discovered and named by Tessmann (1930) and mentioned by no other compilers except Loukotka (1935) and Jijón y Caamaño (1941–43). Tessmann considers it a mixed "stem," *Ge-Arawak-Pano.* The data for linguistic classification seem to be limited to less than 30 words published by Tessmann, surely not enough on which to award it a status as an independent family, as Loukotka (1935) has done. "Uncertain affiliation" is the better decision for the present. The group now speaks *Quechua.* Jijón y Caamaño (1941–43) follows Loukotka in considering *Sabela* an independent "phylum."

The two divisions are *Tihuacuno* (*Tibakuna* and orthographic variants) and *Chiripuno* (*Tschiripuno, Schiripuno*); the degree of linguistic variation between them is not stated. *Tiputini* is close to or identical with *Tihuacuno.*

Steward (Handbook, vol. 3, p. 747) mentions the *Sabela,* with the *Tihuacuno* and *Chiripuno* as tribes of uncertain affiliation. However, Steward and Métraux (Handbook, vol. 3, p. 629) list *Shiripuno* and *Tiputini* as dialects of *Záparo* proper. In this region are many tribal names, *Záparo, Sabela, Jívaro, Chebero, Hibito,* etc., that may well be phonetic variants of one root.

Bibliography.—Tessmann, 1930, pp. 298, 617.

CANELO

Synonyms: *Kanela, Napo, Santa Rosina, Loreto.*

Canelo was superseded by *Quechua* about 1580. The linguistic data are so few that its affiliations will probably never be certain; they may have been with *Záparo, Jívaro,* or *Chibcha.* Steward and Métraux (Handbook, vol. 3, p. 637), following Reinburg (1921), class it with *Záparoan.* Karsten (1935) believes it a mixture of *Jívaro, Záparo,* and *Quechua;* Rivet is (or was) convinced that it was related to *Chibcha.*

Jijón y Caamaño (1941–43) does not list it in his classification but apparently includes it in the *Jívaro* area in his map. Early accounts indicate that it included *Gae*, generally considered a *Záparoan* tongue, as well as three other unknown and extinct languages or dialects: *Ymmunda* or *Ynmuda*, *Guallingo*, and *Sante* or *Santi*. Other minor groups were *Penday*, *Chontoa*, and *Canicha*.

Bibliography.—Karsten, 1935; Reinburg, 1921; Tessmann, 1930, p. 250.

AWISHIRA

The standard classification of *Awishira* (with many orthographic variants such as *Abijira*, *Avixiri*, *Abira*) in the *Tucanoan* family, accepted by Rivet (1924 a), Pericot y García (1936), and Krickeberg (1922), has been doubted in recent years. Dr. J. P. Harrington has recently examined the data and concluded that the material has so far proved insufficient for definite inclusion with *Tucanoan*. Evidence cited in the Handbook (vol. 3, p. 635) suggests its relationship with *Záparoan*. W. Schmidt (1926) leaves it unmentioned. Nimuendajú (map) puts it with the unclassified languages. Neither Tessmann (1930) nor Loukotka (1935) apparently find anything *Tucanoan* in it in their comparison of vocabularies. Tessmann (1930) calls it a mixed-stem language, *Pano-Arawak*. Loukotka (1935) gives it an independent family, *Auiširi*, finding vestiges of *Chibchan* in it. This is probably too radical; as a living language it will probably be found before many years to belong to one of the larger groups, but as that one is uncertain it had best be left unclassified for the present.

Bibliography.—Tessmann, 1930, pp. 495–489.

NORTHERN TROPICAL LOWLAND FAMILIES OF PRESUMED INDEPENDENCE

WARRAUAN

Synonyms: *Warau*, *Waraw*, *Worrow*, *Uarow*, *Guarau*, *Uarauno*, *Waraweti*, *Araote*, *Tivitiva*.

The independence of the *Warrau* linguistic family has been admitted by all authorities since earliest days. A littoral people of peculiar culture, the general feeling is that they preceded the *Carib* and *Arawak* in the Orinoco Delta and Guiana coast. No suggestions as to linguistic affiliations with other groups have been made; the *Arawak* vestiges that Loukotka (1935) finds are probably due to borrowing.

Generally only one language is assigned to the family, but Nimuendajú (map and index) places the *Mariusa* and *Chaguan*, tribes not mentioned by others, with them. The extinct *Waikeri* or *Guayqueri* may also be related; although Rivet (1924 a) considers the latter as *Carib*, Humboldt (1826) reports that they claimed that their language was related to that of the *Guarauno*.

WARRAU

1. *Mariusa*
2. *Chaguan*
3. *Waikerí* (*Guaiquerí*)

Bibliography.—Adam, 1897 b; Brett, 1868, pp. 176–199; Crévaux, Sagot, and Adam, 1882, pp. 263–266; Goeje, 1930, 1930–31; Hilhouse, 1834; Humboldt, 1822–27, 3: 216; Im Thurn, 1883; Olea, 1928; Quandt, 1807; Schomburgk, 1847–58, pp. 47–48; Tavera-Acosta, 1907, pp. 120–123, 1921–22; Williams, J., 1928–29.

AUAKÉAN

Auaké (*Auaqué*, *Auqué*, *Aoaqui*, *Oewaku*) is probably the smallest of all the South American linguistic "families" accepted as independent by all authorities. It may be now extinct, at any rate spoken by only a very small group, possibly of only one family. Unknown to Brinton and Chamberlain, the independent status is based on a vocabulary of some 300 words recorded by Koch-Grünberg (1928) in 1913, which apparently shows no connection with any language with which it has been compared, though Loukotka (1935) sees in it vestiges of *Chibchan*. Consonantal endings are few. Pronominal possession is expressed by prefixes. Armellada and Matallana (1942) call the language *Arutani*.

Bibliography.—Armellada and Matallana, 1942; Koch-Grünberg, 1913, 1922, 1928, 4: 308–313, 331, 332.

CALIANAN

Caliandá (*Kaliana*) is one of the small linguistic groups which, unknown to earlier authorities, was discovered by Koch-Grünberg in 1913. The small vocabulary, collected by him, shows no resemblance to any of the surrounding languages, and the language, without any known subdivisions, is, therefore, accorded independent position by all subsequent compilers. No studies have been made, or at any rate published, upon it, and no suggestions regarding relationship, except that Loukotka (1935) claims vestiges of *Chibcha* in it. It should be distinguished from the *Caliandá* of Tumuc-Humac. Many of the words are monosyllables with consonantal endings. Pronominal possession is expressed by prefixes.

Bibliography.—Koch-Grünberg, 1913, p. 458; 1922, p. 227; 1928, 4: 313–317, 332–333.

MACUAN

The *Macu* (*Mahku*) "family" of the Uraricoera River must be distinguished from several other groups of the same or similar name: the *Sálivan Macu*, the *Puinavean Macú* (Loukotka uses *Makú* for the family name), and the *Cofán Macu* or *Maco*. The family has been accorded independent status since its discovery by Koch-Grünberg on the basis of the rather large vocabulary of nouns collected by him

(1928). Only the single language is known. No suggestions as to wider affiliations have been made, except that Loukotka (1935) finds *Arawak* intrusions. The language is said to be spoken rapidly. Possessive pronominal elements are prefixed. Armellada and Matallana (1942) call the language *Sope.*

Bibliography.—Armellada and Matallana, 1942; Koch-Grünberg, 1913, 1922, p. 227, 1928, 4: 317–324.

SHIRIANÁN

Shirianá (*Sirianá*) is one of the newer families, not recognized by Brinton or Chamberlain, but generally accepted since. Relationship with *Carib* has been suggested but uniformly rejected. The best linguistic source is Koch-Grünberg (1928); the languages are said to be "guttural," the words often with consonantal endings.

The principal languages of the family seem to be *Shirianá* and the less important *Carimé* (*Karimé*). *Waiká* (*Guaicá, Uaicá*) appears to be closer to *Shirianá*, possibly a dialect; it must be distinguished from a *Cariban Waika* in British Guiana, and *Shirianá* must not be confused with the *Arawakan Shiriana* nearby.

Most modern writers are agreed that *Shirianá* and *Waiká* are descended from the historically important *Guaharibo* (*Iaribu, Guahibo, Uariba, Uajaribo, Uaharibo*), though Nimuendajú (map) leaves the latter unclassified; Brinton (1891 a) assumed that they were *Carib.*

SHIRIANÁ

A. *Waharibo* (*Guaharibo*)
    1. *Shirianá*
        a. *Waicá* (*Guaica, Uaica*)
B. *Carimé* (*Karimé*)

Bibliography.—Armellada and Matallana, 1942; Koch-Grünberg, 1913, pp. 454–456, 458, 1928, 4: 302–308, 331, 334; Salathé, 1931–32; Tavera-Acosta, 1921–22, pp. 230–331.

SÁLIVAN, MACU, AND PIARÓA

The independence of this stock has been long and universally recognized, but the names *Sáliva(n)* and *Piaróa(n)* are about equally employed to distinguish it. No suggestions for wider relationships have been made, though Loukotka (1935) sees *Arawak* intrusions in *Sáliva*, and *Carib* vestiges in *Piaróa.*

The majority of authorities agree that three languages compose the family: *Sáliva* (*Sáliba, Sálliba, Sáliua, Sálivi*), *Piaróa*, and *Macu* (*Maco*). Loukotka (1935) groups *Piaróa* and *Macu* in an eastern group, *Sálivi* and *Pamigua* (q. v. infra) in a western group. The *Sálivan Macu* must be distinguished from three other tribes of the same or very similar names: the independent *Macu* of the Auarí River, the *Puinave Macú* and the *Cofan Macu* (q. v.).

Sáliva was one of the nine stocks of the Orinoco Valley established by Gilij (1780–84); the component languages he names as *Ature*, *Piaróa*, and *Quaqua*. The *Ature* (*Adole*) are extinct; the name is also given as a synonym of the *Piaróa*. Brinton (1891 a) says the modern *Quaqua* (*Kuakua*, *Guagua*) speak *Arawak;* Rivet (1924 a) puts them with the *Carib*. Brinton (1891 a) furthermore found no resemblance between *Sáliva* and *Piaróa;* the languages must be considerably different

SÁLIVA (PIARÓA)

I. Western. *Sáliva*
    A. *Sáliva*
II. Eastern: *Piaróa*
    A. *Piaróa*
        1. *Ature* (*Adole*)
        2. *Piaróa*
        3. *Quaqua* (*Guagua*) (?)
    B. *Macu*

Bibliography.—Adelung and Vater, 1806–17; Chaffanjon, 1889, pp. 324–326; Chamberlain, 1910 a, pp. 195–198; Crévaux, Sagot, and Adam, 1882, pp. 257–258; Ernst, 1895, Gilij, 1780–84, pp. 383–384; Koch-Grünberg, 1913, pp. 469–472, 1922, p. 236, 1928, 4: 351–357; Loukotka, 1929–30; Marcano, 1890 a; Oramas, 1914; Rivet, 1920 a; Schuller, 1912 a; Tavera-Acosta, 1907 a, pp. 85–107.

PAMIGUA AND TINIGUA

Castellví has recently (1940) published a vocabulary of *Tinigua*. He finds no resemblance to any other family, but an evident connection with the extinct *Pamigua*. He therefore suggests a *Pamiguan* linguistic family, consisting of *Pamigua* and *Tinigua*. Rivet (1924 a) placed *Pamigua* in the *Guahiban* family, and Loukotka (1935) placed it with *Sáliva* in the western group of *Sálivan* (*Piaróan*). Igualada and Castellví (1940) considered *Tinigua* as composing a third or Southern group of *Sálivan*. The language is still spoken in the Caquetá region of Colombia.

Bibliography.—Castellví, 1940; Jijón y Caamaño, 1941–43, 2:108–109; Ernst, 1891.

OTOMACAN, GUAMO OR GUAMA, AND YARURAN

The *Otomaco* and *Yaruro*, small groups that are close neighbors in southern Venezuela, are limited to one language each. The *Otomaco* are extinct, the *Yaruro* approaching it. Both have been accorded independent linguistic status since, at the least, Brinton (1891 a) and Chamberlain (1913 a).

Otomaco (Otomac, Otomak).—Rivet (1924 a) says the language is called *Tarapita*.[21] Loukotka (1935) sees *Carib* intrusions in it, a distinct possibility.

Guamo or **Guama**.—Loukotka (1935) establishes an independent *Guama* family of one language, the *Guama*, in which he finds vestiges of *Chibchan*. This is apparently the small tribe of southwestern Venezuela termed *Guamo* by other writers. Petrullo (1939) says that their remnants became extinct in recent years. Most authorities do not mention them; Nimuendajú (map) leaves them unclassified. Loukotka (1935) does not mention the data on the basis of which he isolates them, but it is doubtless insufficient evidence on which to establish a new family; they had better be left with the many on which we lack sufficient information for classification. Kirchhoff (Handbook, vol. 4, p. 439) believes that *Guamo* was very closely related to *Otomaco*.

Yaruro (*Yarura, Jaruri, Jaruro, Sayuro, Zavuri, Saururi, Japaria, Yapin, Yuapin, Pume, Pumeh*).—*Pumeh* is said to be their name for themselves. Loukotka's opinion (1935) regarding "*Coroado* intrusions" is to be doubted. Jijón y Caamaño (1941–43) considers *Yaruor* as related to *Chibcha*, forming, with *Esmeralda*, his first or "*Paleo-Chibcha*" group of his *Macro-Chibcha* phylum.

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Otomaco.—Chamberlain, 1910 a, p. 194; Crévaux, Sagot, and Adam, 1882, pp. 262–263; Gilij, 1780–84, 3: 262–263; Rosenblat, 1936; Tavera-Acosta, 1907, pp. 332–374.

Yaruro.—Adelung and Vater, 1806–17; Chaffanjon, 1889, pp. 319–320; Chamberlain, 1910 a, p. 201; Crévaux, Sagot, and Adam, 1882, pp. 260–261; Müller, Frederich, 1882; 1: 360–363, 2; Oramas, 1909; Petrullo, 1939, pp. 265–289; Tavera-Acosta, 1907, pp. 120–133.

GUAHIBAN

Guahibo (*Wahibo, Goahivo, Goahiva, Guayba*, etc.) has been universally recognized as an independent family since earliest days (Brinton, 1891 a; Chamberlain, 1913 a), and no suggestions as to larger relationships have ever been made. Its true status should not be difficult to determine since, in addition to a published grammar (Fernández and Bartolomé, 1895), they form a large living group not very inaccessible. *Churoya*, generally now recognized as one of the languages forming the family, was formerly considered as the type member of another family, the *Churoyan*, accepted by Brinton (1891 a) and at first by Chamberlain (1907). Not all of Brinton's *Churoyan* languages, however, are now considered *Guahiban; Cofán* and *Mako* are generally put with *Cofán* (q. v.). A careful comparison of *Guahibo* and *Cofán* is, therefore, indicated; Ortíz (1943, 1944) doubts the relationship.

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[21] Rivet (1924 a) distinguishes *Tarapita* and *Taparito*, which latter Gillin and Nimuendajú agree with him in considering as *Cariban* (q. v.). Kirchhoff (Handbook, vol. 4, p. 464) calls *Taparita* a variety of *Otomaco;* possibly some confusion in names exists. W. Schmidt (1926) considers *Taparito* as isolated.

GUAHIBO

- I. *Guahibo*
    - A. *Wahibo*
        - 1. *Chiricoa*
            - a. *Sicuane*
        - 2. *Cuiba*
            - a. *Mella*
            - b. *Ptamo*
        - 3. *Yamu*
    - B. *Churuya*
        - 1. *Bisanigua*
    - C. *Cunimía*
        - 1. *Guayabero*

Possibly: *Amorua* (generally placed with *Arawak*), *Catarro*, *Cuiloto*, *Maiba*.

Bibliography.—Chaffanjon, 1889, pp. 320–323; Chamberlain, 1910 a, p. 186 (Churoya); Crévaux, Sagot, and Adam, 1882, pp. 258–260; Ernst, 1891; Fernández de San José and Bartolomé, 1895; Koch-Grünberg, 1913, p. 472, 1928, 4: 443–451; Loukotka, 1929–30, 1938; Marcano, 1890; Ortíz, 1943, 1944; Ossa. V., 1938; Pérez, 1935; Reichel-Dolmatoff, 1944; Rivet, 1912 a, pp. 128–131; Sáenz, 1876, pp. 341–342 (*Churoya*); Schomburgk, 1849; Tavera-Acosta, 1907, pp. 85–95.

PUINAVEAN OR MACÚ

Puinave, a family of slight present extent, may have been formerly much more important and widespread. Rivet, Kok, and Tastevin (1924–25) suggest that it may be a substratum common to many adjacent languages, now so differentiated that a common origin is difficult to prove. It has been recognized as independent since at least the days of Chamberlain (1913 a). W. Lehmann (1920) suggests a possible relationship with *Witoto* (q. v.), which might tie it to *Tupí*. Loukotka (1935) terms the family *Macú* from its most important tribe, and Jijón y Caamaño (1941–43) distinguishes a "Phylum *Makú*," but the older and more generally accepted name *Puinave* is preferable to avoid confusion; *Macú* must be distinguished not only from the *Macu* family, but also from the *Piaróan Macu* and the *Cofán Macu*.

W. Schmidt (1926) includes in the family a *Cabere* language, generally regarded as an *Arawak* dialect.

There is said to be considerable differentiation between the dialects, and much borrowing from *Tucanoan* languages. Some of the linguistic characteristics are: Accent generally on the ultima; vocalic harmony; noun-verb composition; postpositions; compound nouns; pronominal and reciprocal prefixes; gender, pluralizing, tense and mode suffixes.

Puinave or Macú

- I. *Puinave* (*Puinabe, Puinavis, Uaipunabis, Guaipunavos, Uaipis*)
  - A. *Puinave* (*Epined*)
    - 1. Western
      - a. *Bravos, Guaripa*
    - 2. Eastern
      - a. *Mansos*
  - B. *Macú*
    - 1. *Macú*
    - 2. *Tikié*
    - 3. *Kerarí*
    - 4. *Papurí*
    - 5. *Nadöbo*

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Puinave.—Chamberlain, 1910 a, p. 196; Crévaux, Sagot, and Adam, 1882, pp. 255–256; Ernst, 1895, pp. 396–398; Koch-Grünberg, 1928, 4: 335–343; Oramas, 1913 b, pp. 20–25; Tavera-Acosta, 1907, pp. 97–107.

Macú.—Koch-Grünberg, 1906 b, pp. 885–899, 1909–10, 1913, 1922, 1928, vol. 4; Rivet, Kok, and Tastevin, 1924–25, pp. 143–185; Rivet and Tastevin, 1920, pp. 76–81; Tastevin, 1923 a.

TUCANOAN (BETOYAN)

Tucano is one of the important, though not one of the great, linguistic families of South America. It occupies two adjacent homogeneous areas in the northwestern central part of the continent, separated by *Carib* and *Witoto* groups. A small isolated third group to the north is no longer credited. The name refers to the toucan bird, a translation of the native name, Daxsea. There may be 10,000 speakers of the *Tucano* languages today.

The name *Tucano* or *Tukano*, generally accepted today, was first proposed by Beuchat and Rivet (1911). Brinton (1891 a) and Chamberlain (1913 a) termed the family *Betoya*(*n*) from the *Betoi* or *Betoya* tribe. The latter, however, Beuchat and Rivet demonstrated to belong to the *Chibchan* family, as apparently do also a number of the other languages given by Brinton (1891 a, p. 273) as members of the *Betoyan* stock: *Anibali, Kilifaye* (*Quilifaye*), *Situfa, Tunebo*, and probably *Jama*.

No suggestions have been made that would connect *Tucano* with other linguistic families. The languages are said to be characterized by consonantal clusters, nasalization, unclear pronunciation, and unusual phonemes. Stems are composed, verbal modifications are by means of suffixes, there being apparently no verbal prefixes and no reduplication. Nominal plural is expressed by suffixes or by modifications of the ultima; prepositional relations are shown by postpositions. Indirect object is expressed by a suffix, as is feminine gender.

No careful attempt has ever been made to subdivide the *Tucano* languages on a linguistic basis. It is generally assumed that linguistic divisions follow the geographical ones, adjacent tribes speaking more closely related languages than distant ones, sibs of tribes speaking dialects. This divides the family into two main groups. This classification is herein accepted as the only available one, with the realization that it may be without any basis.

The following classification is based primarily on Steward (Handbook, vol. 3, pp. 737–741) and Goldman (Handbook, vol. 3, pp. 764–766), partly on W. Schmidt (1926). It is very tentative.

TUCANO CLASSIFICATION

- I. Eastern *Tucano*
  - A. *Cubeo* (*Cobewa, Kobeua, Pamiwa*)
    - 1. *Cubeo*
      - a. *Hölöna* (*Holowa?*)
      - b. *Hahänana* (*Hehenawa*)
  - B. *Tucano-Tuyuca*
    - 1. *Tucano* (*Dächsea*)
      - a. *Arapaso* (*Coreä*)
      - b. *Neenoä*
      - c. *Yohoroä*
      - d. *Uiua Tapuyo*
    - 2. *Tuyuca* (*Dochkäfuara*)
      - a. *Barä* [1]
      - b. *Tsolä*
    - 3. *Wanana* (*Ananas, Kótitia*)
      - a. *Waiana* (*Yurutí Tapuya*)
      - b. *Piratapuyo* (*Waickea, Urubú Tapuya*)
      - c. *Uaicana*
      - d. *Uainana*
    - 4. *Carapaná* [2] (*Mõchda*)
    - 5. *Wásöna* (*Pisá Tapuya*)
    - 6. *Pamóa* (*Tatú Tapuya*)
  - C. *Buhágana* (*Carawatana-mira*)
    - 1. *Macuna*
      - a. *Hobacana* (*Japuana*)
    - 2. *Buhágana*
      - a. *Ömöa*
      - b. *Sära*
      - c. *Doä*
      - d. *Tsaina*
      - e. *Tsoloá*
      - f. *Yäba*
  - D. *Desana* (*Winá*)
    - 1. *Yupuá*
  - E. *Cueretú*
    - 1. *Cashiita* (*Kusiita*)

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[1] W. Schmidt (1926) considers *Bara, Uaiana, Uasōna, Mōchdāā,* and *Pamoa* as subtribes of *Uanána.*

[2] Loukotka (1935) considers *Carapana* as *Witoto,* mixed with *Tucano*

Tucano Classification—Continued

- I. Eastern *Tucano*—Continued
  - F. *Yahuna*
    - 1. *Opaina* (*Tanimboca*)
    - 2. *Dätuana*
  - G. *Bölöa*
  - H. *Erulia*
- II. Western *Tucano* [3]
  - A. *Piojé-Sioni* [4]
    - 1. *Encabellado* (*Icaguate, Angutera*)
      - a. *Piojé* (*Pioche*)
      - b. *Encabellado*
      - c. *Secoya-Gai*
      - d. *Campuya*
      - e. *Santa Maria*
      - f. *Guaciguaje*
      - g. *Cieguaje*
      - h. *Macaguaje*
      - i. *Amaguaje*
    - 2. *Sioni*
  - B. *Correguaje-Tama* [5]
    - 1. *Correguaje*
      - a. *Correguaje*
    - 2. *Tama* (*Tamao*)
      - a. (*Ayrico*)
  - C. Coto

Other possible Western *Tucano* languages or dialects are: *Tetete*,[6] *Pasto*,[7] and *Awishiri* [8] (q. v.).

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[3] See Steward (Handbook, vol. 3, pp. 737–739) for smaller *Encabellado* divisions; Beuchat and Rivet (1911) for many small *Tucano* subdivisions and synonyms.

[4] The terminology among the *Piojé-Cioni* is greatly confused. Steward (Handbook, vol 3, p. 738) states that the five principal names *Encabellado, Icaguate, Piojé, Santa Maria*, and *Angutera* are synonyms for the entire group as well as names of divisions used at different periods.

[5] The *Correguaje* and *Tama* are said to be closely linked, but Rivet (1924 a) places *Tama*, together with *Ayrico*, the latter not mentioned by other modern sources, in a third or *Northern Tucano* group, leaving *Correguaje* with the *Western Tucano*.

[6] *Tetete* is mentioned as an important *Western Tucano* group by Castellví (Igualada and Castellví, 1940) and Loukotka (1939 a).

[7] On grounds of toponymy Rivet (1924 a) places the extinct and peripheral *Pasto* with the Western *Tucano;* Loukotka (1935) accepts this. It is herein classified with the *Barbacoa* group of *Chibchan*.

[8] One of the doubtful questions is the inclusion of the *Awishiri* (*Abijira*, etc.) (q. v.), traditionally included with the *Tucano*. (See independent article supra under *Záparoan* classification.

Other groups, considered by one or more authorities as *Tucano* and not disputed by others, are: *Bahukiwa, Corocoro Tapuya, Corowa, Palanoa, Patsoca, Usa Tapuya, Wantuya, Yi Tapuya, Yiboya Tapuya*. Some of these may be synonyms of others given above.

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Martius, 1867, 2:164–166, 275–276, 281–285; Stradelli, 1910, pp. 236–317; Wallace, 1853, pp. 520–521.

Western.—Anonymous, 1909, 1919 e; Chantre y Herrera, 1901; Crevaux, 1882; González Suárez, 1904, pp. 63–64; Rivas, 1944; Rocha, 1905, pp. 199–201; Simson, 1879 a, pp. 210–222, 1886; Tessmann, 1930, pp. 205–221.

COTO

The *Coto* (*Koto*) is one of several groups known as *Orejón*, "big ears," and sometimes *Coto* is considered the only synonym of *Orejón* (Nimuendajú, index). However, an extinct group of southern *Witoto* was also known by this name (q. v.). The *Coto* (as apart from *Orejón*) are placed by all authorities under *Tucano*, and Tessmann (1930) reports that his 235-word vocabulary is nearly pure *Tucano*. He says that in addition to *Orejón* they are known as *Payagua* and *Tutapisho*. There are said to be 500 living today. They must be distinguished from the *Chibchan Coto* of Costa Rica.

Bibliography.—Marcoy, 1875; Simson, 1886; Tessmann, 1930, pp. 189–205.

CAHUAPANAN

The *Cahuapana* (*Kahuapana*, *Cawapana*, *Maina*) family is relatively unimportant, occupying a small region without enclaves, and spoken by a few thousand persons. Though it will probably eventually be found to belong to some greater family or phylum, no suggestions of larger relationships seem to have been made: Rivet, who has published the principal studies (Beuchat and Rivet, 1909; Rivet and Tastevin, 1931), made none. Within the family the classification is also difficult; little is known of many of the languages and dialects, and many, which would better be left unclassified pending fuller data, are generally included on purely geographical grounds. The name *Cahuapana*, preferred by Beuchat and Rivet, supplants the former *Mainan* or *Mayna* of Brinton (1891 a) and Chamberlain (1913 a).

The language is said to be harsh and difficult. A kind of true inflection with different suffixes for each tense and person is found. Modal relations are expressed by either suffixes or prefixes, also some infixes, but verbal and nominal suffixes predominate over prefixes. Pronominal (except subject) and gender relations are shown by suffixes, as are nominal and verbal pluralization.

Loukotka adds an extinct *Mikirá* to the family. *Omurano* (*Humurano*) and *Roamaina* (q. v.) were long considered prominent members of this family but are not mentioned by later authorities. Hervás y Panduro (1800) gave *Chayavita* as a separate stock, consisting of *Cahuapano* and *Paranapuro*. See Handbook (vol. 3, pp. 605–608) for comments on relationships and critique of former classifications.

Steward and Métraux question the relationship of the entire *Mayna* group.

CAHUAPANAN

- I. *Cahuapana*
  - A. *Cahuapana*
    - 1. *Cahuapana*
    - 2. *Concho* (*Chonzo*)
- II. *Chébero* (*Xevero*)
  - 1. *Chébero*[1]
  - 2. *Chayawita* (*Chawi*)
    - a. *Chayawita*
    - b. *Yamorai* (*Balsapuertino*)[2]
  - 3. *Ataguate*[3] (?)

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[1] *Chèbero* (*Xèvero*) must not be confused with the *Jívaro* (*Xívero*) (q. v.) or the *Hibito*.

[2] The *Yamorai* are mentioned only by Tessmann (1930), on whose opinion they are here included.

[3] *Ataguate* is mentioned only by Beuchat and Rivet (1909, p. 619), who also include *Cutinana* and *Tirilo*, languages apparently related to *Aguano* (q. v.).

Bibliography.—Adelung and Vater, 1806–17; Beuchat and Rivet, 1909; Brinton, 1892 a, pp. 21–29; Ortíz 1941 b; Rivet, 1912 a; Rivet and Tastevin, 1931; Schuller, 1912 d; Tessmann, 1930, pp. 378, 415, 440–444; Veigl, 1785 a.

MUNICHE

Synonyms: *Munitschi*, *Muniči*, *Paranapura*.

Muniche was one of the old stocks of Hervás y Panduro (1800), quoted without comment by Brinton (1891 a). The component languages were *Muchimo* and *Otanabe*, doubtless extinct and not mentioned by any recent writer. Neither was *Muniche* until Tessmann (1930) rediscovered it. He considers it a mixed-stem language, *Ge-Pano*, with 16 resemblances, in about equal proportion, out of the 33 that he used as a criterion. Loukotka (1935), the only compiler who mentions the group, gives it independent status. Steward and Métraux (Handbook, vol. 3, pp. 606–607) consider *Muniche* related to *Chébero*, of the *Mayna* branch of *Cawapana*. As Tessmann's collected vocabulary amounts to only 38 words, this is hardly enough on which to base any opinion; it should be left unclassified pending further study. Tessmann (1930) appears to be the sole source of information.

MUNICHE

1. *Muniche*
2. *Muchimo*
3. *Otanabe*
4. *Churitana*

PANOAN

Pano is one of the major linguistic families with many subdivisions. Tradition brings them from the north, but no relationship with any other family has ever been suggested, much less demonstrated.

Rivet (1924 a) observes that the *Tacana* group (q. v.), which he believes to be *Arawak*, shows considerable grammatical resemblances to *Pano*. Neighboring languages seem to have affected the *Panoan* languages little. Comparatively few of the component languages are extinct and some groups number several thousands; the total number of speakers may be about 15,000. They occupy four isolated homogeneous areas east of the Andes in far west Brazil and adjacent republics; the central one is the largest in area, number of groups, and importance. Not even vocabularies exist from many, probably from most, of the tribes, and no classification other than into the three main areas, has ever been attempted. Such comparisons as have been made indicate that the linguistic groupings on the whole follow the geographical divisions. The languages of the Juruá-Purús seem to fall with the central group rather than with the southwestern or the southeastern.

The main or central branch of the *Pano* comprises a very large number of tribes and subtribes, each of which doubtless spoke a more or less variant language or dialect. For lack of sufficient data, no one has attempted a classification of these languages, though some are said to be mutually intelligible, others not. On the presumption that adjacent and affiliated groups are linguistically more closely related than more distant groups some classification may be made, but this is a dangerous assumption, the groupings highly tentative. The two main groups are those on the Ucayali, the names of which typically end in *-bo* (a pluralizing suffix), and those on the Juruá and Purús, with the majority of names ending in *-nawa*, meaning "strangers."

THE CHAMA LANGUAGES

The *Conibo*, *Setebo*, and *Shipibo* of the Ucayali River are grouped under the *Chama* (*Tschama*, *Čama*), and are apparently mutually intelligible. While the groups are large and important, the speech forms would probably be classed as varieties or dialects of the *Chama* language. This must be distinguished from the *Tacanan Chama* on the Madidi River. Except for the three above-named main groups there is disagreement regarding the affiliation of certain other groups with *Chama*.

According to Steward and Métraux (Handbook, vol. 3, pp. 559–560), *Setibo* is divided into two subgroups, *Sensi* and *Panobo*, which, perhaps with *Puinawa*, separated from the parent group in recent days. As regards *Panobo* there is general agreement on its close association with *Setibo*. *Pano*, *Pelado*, *Manoa*, and *Cashiboyano* are given as synonyms or subdivisions. In addition to the obvious synonyms (*Sensivo*, *Ssenssi*, *Senci*, *Senti*), *Tenti*, *Barbudo*, and *Mananawa* (*Mananahua*, *Mananagua*) are given as synonyms of *Sensi*. There is great diversity of opinion regarding *Mananawa*, which Rivet (1910 b) considers a branch of *Shipibo*, Tessmann (1930) a branch of *Cashibo*. Nimuendajú (index) refuses to classify *Mananawa*; K. G. Grubb (1927, p. 83), calls it a subtribe of *Remo* (q. v.) with the subdivisions *Marubo* and *Pisabo* (q. v.); the latter languages are not generally classed in the *Chama* group. Steward and Métraux (Handbook, vol. 3, p. 560) consider *Ynubu*, *Runubu*, and *Casca* as subdivisions of *Sensi*, inferentially dialects or varieties thereof. Both Tessmann (1930) and Loukotka (1935) claim that *Sensi* is not as pure *Pano* as the other *Chama* languages; Loukotka places it in a separate "mixed" group.

Steward and Métraux (Handbook, vol. 3, p. 561) say that *Shipibo* is the same language as *Setibo* and the extinct *Caliseca* (*Kaliseka*). Rivet (1910 b) agrees with the latter and adds *Mananawa* as a subtribe. The name *Caliseca* has not been used since the 17th century (Steward and Métraux, Handbook, vol. 3, p. 561) and it is disputed whether they were the modern *Shipibo* or *Cashibo*.

CASHIBO

Cashibo (*Kaschibo, Cachibo, Cahibo, Cacibo, Caxibo, Casibo, Cahivo, Kassibo, Kašibo*), also given the synonyms of *Mananawa* (*Mananagua, Managua, Mananabua*), *Carapacho*, *Haqueti* (*Hagueti*), and *San Lorenzo*, is generally placed in the *Chama* language, but according to a local missionary (Rankin, personal correspondence) the speech of the *Cashibo* is unintelligible to the *Conibo-Shipibo-Setibo*. The subgroups are given as *Cacataibo* (*Kakataibo*), *Cashiño*, and *Ruño* by Steward and Métraux (Handbook, vol. 3, p. 564); as *Buninawa* (*Bununahua*, etc.), *Carapacho* (*Karapatša*, etc.), and *Puchanawa* (*Putšanahua*, etc.) by Rivet (1910 b), and as *Cashinó* (*Kaschinó*) and *Shirinó* (*Ssirinó*) by Tessmann (1930). K. G. Grubb (1927, p. 84) says that the *Cashinawa* are closely related. The differences of opinion regarding *Mananawa* and *Caliseca*, listed above as synonyms of *Cashibo*, have been already considered. Steward and Métraux (Handbook, vol. 3, p. 564) consider *Carapacho* as of uncertain affiliation; P. Marcoy (1875) calls it a synonym of *Caliseca*.

Nocoman (*Nokamán*), recently identified by Tessmann (1930, p. 172), is probably now extinct. It was formerly confused with *Cashibo* (Handbook, vol. 3, p. 567). Nimuendajú (map) leaves it unclassified. Loukotka (1935) and Jijón y Caamaño (1941–43) place it with *Pano*.

Other languages or dialects, generally agreed to be *Panoan*, whose closer affiliations are unknown but which probably belong in the Ucayali group, are *Pichobo* (*Pitsubo, Pichaba, Pitsobu, Pisabo*, etc.) and *Soboibo* (*Saboibo, Soboyo, Soyboibo, Bolbo*); *Mochobo* (*Mochovo, Uni-*

vitza) and *Comobo* (*Comavo, Comambo, Univitza*). K. G. Grubb (1927) calls *Pisabo* a subdivision of *Mananawa*, the latter a subtribe of *Remo*.

Considered as *Pano* by Nimuendajú (map), but not noted in other lists: *Mainawa* (distinct from *Marinawa*), *Yananawa*, and *Yumbanawa*.

Considered as *Pano* by Nimuendajú (map); listed as unidentified tribes of Ucayali by Steward and Métraux (Handbook, vol. 3, p. 567): *Puyamanawa* (*Punyamumanawa*) and *Camarinawa* (*Kamarinigua*).

Ruanawa (*Ruanagua, Rununawa*) and *Puynawa* (*Poyanawa, Poianaua, Puynagua*) are less often mentioned *Panoan* groups (Steward and Métraux, Handbook, vol. 3, p. 566).

The following groups of the Juruá-Purús Basin are considered as *Panoan*, without any suggestion as to their relationships inter se or with neighboring groups. Probably each is entitled to the status of a dialect or variety, though some may be radically different.

Canamarí, (*Kanawarí*, etc.).—These must be distinguished from the *Arawak* and *Catukina Canamari*. W. Schmidt (1926) places them with the *Catukina* in a separate Middle Group of *Pano*, a division of the *Northern Pano* not recognized by other authorities.

Curina (*Kulino*, etc.).—These must be distinguished from the *Arawak Culino* or *Kurina*.

Contanawa (*Kuontanaua*, etc.).

Espinó.

Marinawa.

Nana, probably same as *Nawa*.

Nawa.

Pacanawa (*Pakanaua*, etc.).

Shanindawa (*Shaninawà, Šaninaua*). Distinguish from *Saninawa*.

Shipinawa (*Šipinaua*, etc.).

Tushinawa (*Tušinaua*, etc.).

Yaminawa (*Jaminaua, Yuminawa*, etc.).

Yawavo (*Jauabo, Yawabu*, etc.). Distinguish from Southeastern *Pano Jaunavo* or *Caripuná*.

Yura.

Remo (*Rhemo*), *Sacuya*, *Maspo* (*Impeniteri*), *Nucuini*, *Cuyanawa*, and *Niarawa* (*Niamagua*) seem to form a related group. Possibly all belong with the *Chama* language, since Steward and Métraux (Handbook, vol. 3, p. 565) call *Remo* a *Conibo* dialect. *Mananawa* is mentioned as a subtribe of *Remo*, but this is not generally accepted. *Nucuini* is considered by Loukotka (1935) as a synonym of *Remo*. *Sacuya* (*Sakuya*) is generally linked with *Remo* and probably is a subgroup. *Maspo* or *Impeniteri* is also generally linked with *Remo*. *Cuyanawa* (*Kuyanahua*, etc.) is apparently associated with *Nucuini*.

Possibly to the above group belongs *Capanawa* (*Kapanagua, Kapahuana*, etc.) with its subgroup *Buskipani* (*Busquipani*). The latter name has also sometimes been considered as a synonym of *Amawaca.*

Various opinions seem to correlate the languages or dialects *Catukina, Arara, Ararapina, Ararawa, Saninawa, Saninawacana,* and *Shawanawa. Catukina* (*Katoquino,* etc.) must be distinguished from four other languages of the same name of other families. Schmidt (1926) places it with *Canamari* in a separate Middle Group of *Pano.*

Pericot y García (1936) considers *Arara, Ararapina,* and *Ararawa* as subgroups of *Catukina,* and Rivet (1924 a) states that these three are doubtless identical with *Saninawa.* Métraux (Handbook, vol. 3, p. 660) links *Shawanawa* with the *Arara* group, and believes that *Saninawa* is related to *Saninawacana.*

According to Steward and Métraux (Handbook, vol. 3, p. 565), the *Amawaca* (*Amaguaco, Amajuaka, Ameuhaque,* etc.) are close relatives of the *Cashinawa* (*Kachinaua, Cushinahua, Caxinagua,* etc.). Rivet (1924 a) gives *Maspo* and *Impetineri* as synonyms of *Amawaca* but Steward and Métraux (Handbook, vol. 3, p. 566) place the former in another group. *Sayaca* (*Sacuya* ?) and *Busquipani* have also been given as synonyms (or subdivisions) of *Amawaca,* but these also seem to belong to other groups (vide supra); nevertheless, the possibility of the relationship of all these must be considered. Pericot y García (1936) calls *Arawa* a subtribe of *Amawaca; Arawa* is generally placed with the Southwestern *Pano* group (q. v.). Steward and Métraux (Handbook, vol. 3, p. 566) believe that the extinct *Amenwaca* (*Amenguaca*) is a synonym of *Amawaca;* it has many groups and subgroups, the best known of which are *Inuvakeu* and *Viwivakeu* (*Viuivaqueu*). W. Schmidt (1926) links *Cashinawa* with *Sheminawa.*

Of the groups mentioned above, Steward and Métraux (Handbook, vol. 3, p. 567) consider these Ucayali languages unidentified but probably *Panoan: Camarinawa, Puyamanawa, Saninawaca,* and *Sinabu.* Also these not before mentioned: *Awanawa* (*Aguanagua*), *Chunti, Diabu, Isunawa* (*Ysunagua*), *Ormiga, Trompetero,* and *Viabu.*

There is general agreement as to the composition of the *Southwestern Panoan* group in the region of the basin of the Inambari. The two important groups seem to be *Arasa* (*Arasaire, Arazaire, Aratsaira*) and *Atsawaca-Yamiaca.* The *Atsawaca* (*Atsahuaka,* etc.) or *Chaspa,* and the *Yamiaca* (*Yamiaka*) or *Hasuñeiri* dialects (*?*) must be very similar, as they are said to have separated in historic times. *Arasa* is probably more divergent. Some of the *Arasa* and *Atsawaca* also speak *Tacana* (*Arawak ?*) and are often classified in that group. Nordenskiöld's *Arasa* vocabulary (1908) is *Tacana,* but Llosa's *Arasaire* vocabulary (1906) is *Panoan.*

A doubtful member of this group is *Araua,* which language must be considerably different from the others. Nimuendajú (map) leaves it unclassified; others consider it a link between the *Southwestern* and *Northern Pano*. Stiglich (1908) considers it a small group of *Amawaca* (*Northern Pano*). It must be distinguished from the *Arawak Araua*.

The *Southeastern Pano* group is generally known as *Pacaguará* (*Pacawara, Pakavara*). The consensus is that the *Pacaguará* group consists of four languages, the interrelations of which are not suggested. These four are *Chacobo* (*Tschakobo*), *Caripuná, Capuibo* (*Kapuibo*), and *Sinabo;* the position of the latter alone is disputed. The *Caripuná* (*Karipuná*) or *Jau-navo* (*Jaûn Avô*) are divided into subtribes, the *Jacariá* (*Jakariá, Yacariae, Jacaré-Tapuüya, Yacaré-Tapuuya*) and the *Pamá* (*Pamaná*).

The position of the *Sinabo* is uncertain. Two groups are mentioned in the literature, the *Sinabo* and the *Shenabu*, with intermediate orthographical variants. Rivet (1924 a) classifies them both as members of the *Pacaguará* group, and probably synonymous. One or the other is also classified as a subtribe of *Shipibo* (*Northern Pano*), as related to *Sensi*, and as unidentified. Doubtful also is the position of *Zurina;* Métraux (Handbook, vol. 3, p. 450) apparently considers it a member of the *Pacaraguá* group while Nimuendajú (map) leaves it unclassified; the others fail to mention it.

Pano

I. Central
    A. *Chama* (Ucayali)
        1. *Conibo*
            a. *Conibo*
            b. *Shipibo*
                a. Caliseca, Sinabo (?)
                b. Manamabobo, Manava
            c. *Setebo*
                a. Sensi: Casca, Runubu, Ynubu, Barbudo, Tenti, Mananawa (?)
                b. Panobo: Pano, Pelado, Manoa, Cashiboyano
        2. *Cashibo* (*Comabo*)
            a. *Cacataibo*
            b. *Cashiño*
            c. *Ruño*
            d. *Buninawa*
            e. *Carapacho* (?)
            f. *Puchanawa*
            g. *Shirinó*
    B. *Curina* (*Kulino*)[1]
    C. *Capanawa*
        1. *Capanawa*
            a. *Buskipani*
        2. *Remo*
            a. *Sacuya*

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[1] Distinguish from neighboring *Arawak Culino* or *Culina*.

PANO—Continued

- I. Central—Continued
    - C. *Capanawa*—Continued
        - 3. *Maspo*
            - a. *Epetineri* (*Impenitari*)[2]
        - 4. *Nucuini*
            - a. *Cuyanawa*
        - 5. *Niarawa*
        - 6. *Puyamanawa* (?)
    - D. *Amawaca* (*Amenguaca* ?)
        - 1. *Amawaca*
            - a. *Cashinawa*
                - *a.* *Sheminawa*
            - b. *Inuvakeu*
            - c. *Viwivakeu*
        - 2. *Pichobo*
            - a. *Pichobo* (*Pisobo*)
            - b. *Soboibo*
                - *a.* *Ruanawa*
            - c. *Mochobo*
                - *a.* *Comobo*
    - E. *Catukina*[3]
        - 1. *Arara*
            - a. *Shawanawa*
        - 2. *Ararapina*
        - 3. *Ararawa*
        - 4. *Saninawa*
            - a. *Saninawacana*
    - F. Juruá-Purús
        - 1. *Povanawa*
        - 2. *Shipinawa*
        - 3. *Ararawa*
        - 4. *Yauavo*
        - 5. *Yaminawa*
        - 6. *Rununawa*
        - 7. *Contanawa*
        - 8. *Yawanawa*
        - 9. *Pacanawa*
        - 10. *Yumbanawa*
        - 11. *Yura*
        - 12. *Tushinawa*
        - 13. *Marinawa*
        - 14. *Espinó*
        - 15. *Manawa*
        - 16. *Canamari*[4]

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[2] Steward and Métraux (Handbook, vol. 3, p. 565) list *Ipitinere* as a synonym of *Amahuaca*, but in an earlier section (Handbook, vol. 3, p. 541) give *Epetineri* as a probably *Arawakan* group.

[3] Distinguish from *Arawak* and from *Catukina Catukina*.

[4] Distinguish from *Arawak* and *Catukina Canamari*.

PANO—Continued

- II. Southwest
    - A. *Arasaire*
    - B. *Atsawaca*
        - 1. *Atsawaca*
        - 2. *Yamiaca*
    - C. *Arauá* (?)
- III. Southeast
    - A. *Pacawará*
        - 1. *Chacobo*
        - 2. *Caripuná* (*Jau-navo*)
            - a. *Jacariá*
            - b. *Pamá* (*Pamaná*)
        - 3. *Capuibo*
        - 4. *Sinabo*
    - B. *Zurina* (?)

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Curina-Kulino.—Carvalho, 1929, 1931; Martius, 1867, 2:242–244.

Capanawa Group.—*Remo*: Carvalho, 1929, 1931, pp. 254–256; Tessmann, 1930, pp. 580–582. *Capanahua*: Tessmann, 1930, p. 156.

Amawaca-Cashinawa.—Abreu, 1914, pp. 524–546, 1938 b; Farabee, 1922, pp. 105–114; Stegelmann, 1903, p. 137; Steinen, 1904; Tessmann, 1930, pp. 158–170.

Catukina.—Rivet, 1920 b, p. 87; Rivet and Tastevin, 1924, 1927–29, pp. 489–516.

Juruá-Purús Group.—Carvalho, 1931, pp. 234–252; Chandless, 1866, p. 118 (*Canamari*); Rivet and Tastevin, 1927–29; Stegelmann, 1903, pp. 135–137.

Southwest.—*Arasaire*: Aza, 1933 b, 1935, 1937; Cipriani, C. A., 1902; Llosa, 1906; Rivet, 1910 b. *Atsawaca-Yamiaca*: Anonymous, 1902; Barranca, J. S., 1914; Cipriani, C. A., 1902; Créqui-Montfort and Rivet, 1913 e; Farabee, 1922; Nordenskiöld, 1905; Rivet, 1910 b. *Arawa*: Stiglich, 1908.

Southeast.—*Pacawará*: Armentia, 1888, 1898; Heath, E., 1883; Orbigny, 1839, 1:164; Rivet, 1910 b; *Chacobo*: Cardus, 1886, p. 315; Nordenskiöld, 1911 b, pp. 230–240; Pauly, 1928, p. 138; *Caripuna*: Keller, Fr., 1874, pp. 158–159; Martius, 1867, 2:240–242; Pauly, 1928, p. 143.

MAYORUNA

Synonyms: *Mujuruna*, *Maxuruna*, *Mashoruna*, *Mashobuna*, *Maioruna*, *Morike*, *Pelado*.

Mayoruna is generally accepted as a *Panoan* language (Brinton, 1891 a; Rivet, 1924 a; Krickeberg, 1922: Schmidt, W., 1926; Nimuendajú, map and index; Jijón y Caamaño, 1941–43). However, Tessmann and Loukotka see nothing *Panoan* in it. Tessmann (1930) considers it a mixture of *Arawak* and *Tupí*; Loukotka gives it independent status, at first (1935) terming it *Mayoruna* family, *Morike* language, and later (1939 a) *Morike* family; he sees *Arawak* intrusions in it. Steward and Métraux (Handbook, vol. 3, p. 551) consider it a *Panoan* group. It had best be left unclassified; the linguistic data are poor.

Two subtribes are generally recognized, *Maruba* and *Chirabo* (Tessmann, 1930). However, the opinions regarding these and other possible subdivisions are very contradictory. The synonym *Pelado* is also given as a synonym for *Panobo*. *Maruba* (*Marubo*, *Moruba*, *Marova*, *Marahua*) is considered by Loukotka a synonym for *Mayoruna;* Tessmann (1930) considers it of uncertain affiliation but probably *Panoan;* K. G. Grubb (1927) calls *Marubo* and *Pisabo* subdivisions of *Mananawa* (q. v.); others agree to the *Pano* affinities. *Chirabo* (*Čirabo*, *Tširabo*) is generally accepted as *Panoan*.

Bibliography.—Castelnau, 1852, pp. 299–300; Martius, 1867, 2:236–239; Tessmann, 1930, pp. 368–378, 582.

ITUCALE, SIMACU, AND URARINA

Itucalean was considered as an independent family until at least the time of Chamberlain (1913 a), though he noted the suggestion of Beuchat and Rivet (1909) that it might be *Panoan*. The latter opinion has been accepted by most recent authorities. *Itucale*, *Urarina*, *Shimacu*, *Chambira*, *Singacuchusca*, and *Arucui* have been placed in this group by various writers; it is not unlikely that not all are related, some *Panoan*, others not. Tessman (1930) finds no *Panoan* resemblances in *Simacu*, and considers it a mixture of *Tucano* and *Arawak*, with about equal lexical resemblance to *Tucano*, *Arawak*, and *Ge*. Loukotka (1935) agrees with him, finds only vestiges of *Pano*, and makes *Simacu* an independent family. The *Itucale* and *Urarina*, at least, are probably extinct; the latter is generally classified as *Panoan*. According to Steward and Métraux (Handbook, vol. 3, p. 557), *Urarina* was once reported to be related to *Mayoruna* (q. v.), while the *Itucale* were said to have spoken the same (*Tupian*) language as the *Cocamilla*.

As the lexical resemblances reported by Tessmann (1930) total less than 10 percent of his collected vocabulary of over 300 words they may well all be borrowed words of no value for classificatory purposes. This vocabulary should be sufficient for a determination of the true relationship of *Simacu*, at least, without further field investigation. In the present status, all these languages had best be considered as unclassified.

Bibliography.—Beuchat and Rivet, 1909, p. 621; Chamberlain, 1910 a, pp. 189–190; Rivet, 1912 a; Tessmann, 1930, p. 486.

AGUANO

It is disputed whether the *Aguano* (*Aguanu, Awano, Santa Crucino*) group of languages was independent, *Panoan,* or *Cahuapanan.* Whatever the former language, it was given up in favor of *Quechua,* probably some time after the Spanish Conquest. The group apparently consisted of three divisions (see Handbook, vol. 3, pp. 557–558), the *Aguano* Proper, *Cutinana,* and *Mapurina.* Other tribes of uncertain affiliation and subclassification are *Chamicura* and possibly *Sicluna. Chamicura* and *Maparina* are considered *Panoan* by Rivet (1924 a). *Cutinana* Beuchat and Rivet (1909) consider as akin to *Chebero,* that is, belonging to the *Cahuapanan* family. But the *Cutinana* are reported as having spoken the same language as the *Aguano* and *Maparina,* and whatever affiliation can be proved for any of these languages would seemingly apply to the entire *Aguano* group.

AGUANO

A. *Aguano* Proper
  1. *Seculusepa*
    a. *Chilicawa*
  2. *Melikine*
  1. a. *Tivilo*
B. *Cutinana*
C. *Maparina*

Bibliography.—Tessmann, 1930, p. 253.

CHAMICURO

Chamicuro (*Chamicura, Tschamikuro,* etc.) is generally considered a *Chama* (*Panoan*) language, and Steward and Métraux (Handbook, vol. 3, p. 559) call it "closely related to *Shipibo,*" with the subtribe *Chicluna,* but, unless an entirely different language of the same name is referred to, some other opinions are at entire variance. While Rivet (1924 a) agrees that it is *Pano,* both Tessmann (1930) and Loukotka (1935) find nothing *Panoan* in it, but consider it a mixture of *Arawak* and *Tucano.* Elsewhere (Handbook, vol. 3, p. 558) Steward and Métraux remark that if *Chamicuro* is *Panoan,* then all the *Aguano* group of languages is.

Bibliography.—Tessmann, 1930, p. 397.

SOUTHERN TROPICAL LOWLAND FAMILIES OF PRESUMED INDEPENDENCE

UNCLASSIFIED LANGUAGES OF EASTERN PERÚ

In the forests of eastern Perú are, or were, a large number of slightly known tribes, some now extinct, assimilated or deculturized. On most, there are little or no linguistic data. In addition to a few specifically discussed elsewhere, the more important of them are: *Alon*, *Amasifuin*, *Carapacho*, *Cascoasoa*, *Chedua*, *Cholto*, *Chunanawa*, *Chusco*, *Cognomona*, *Chupacho*, *Huayana*, *Kikidcana* (*Quiquidcana*), *Moyo-pampa*, *Nindaso*, *Nomona*, *Pantahua*, *Payanso*, *Tepqui*, *Tingan*, *Tulumayo*, and *Zapazo*. Most of these spoke *Quechua* when first discovered.

SMALL "FAMILIES" OF BOLIVIA

There are at least seven languages of northern and western Bolivia that are generally considered independent: *Itonama*, *Canichana*, *Cayuvava*, *Movima*, *Moseten*, *Leco*, and *Yuracare*. Most of them are without known subdivisions, and no evidences for larger affiliations have ever been presented. Most of them have been the subject of special studies. None is known to be extinct, though the speakers are not numerous. Scientific linguistic field research and study upon them is greatly needed, and it will probably eventually be found that they are very variant members of better known families. All have always been known by minor orthographical variants of their standard name.

ITONAMAN

All authorities consider *Itonama* as independent, isolated, or unclassified. *Machoto* is given as a synonym. Markham (1910) considered it a branch of *Mojo*. Loukotka (1935) believed he saw evidences of *Arawak* intrusion.

The available linguistic data are limited to about 300 words in several collected vocabularies and prayers. The language seems to be both grammatically and lexically different from all its neighbors, rather complex in distinction to other Bolivian languages, which Rivet believes to be rather simple. The pronominal subject is said to be different for men and for women in the second person. "Prepositions" are prefixed, as are possessive pronouns. The verb employs both prefixes and suffixes.

Bibliography.—Adam, 1897–98; Adelung and Vater, 1806–17; Cardus, 1886; Chamberlain, 1910 a; Créqui-Montfort and Rivet, 1916–17; Fonseca, J. S. da, 1880–81; Gillin, 1940; Métraux, 1942 a, p. 83; Nordenskiöld, 1915 a; Orbigny, 1839; Pauly, 1928, p. 173; Rivet, 1921 a.

CANICHANAN

Synonyms: *Kanichana, Kanitšana, Kaničana, Kanitschana, Canisiana, Kanisiana, Canesi, Canechi.*

Except that Markham (1910) considered it a branch of *Mojo*, there has never been any suggestion of wider affiliations for *Canichana*. The extinction of the language seems to be disputed.

The available linguistic data are limited to about 240 words in three vocabularies. These seem to show no resemblance to any surrounding language. *Canichana* shows less resemblance to *Uro* than does *Chapacura.* The pronominal possessive is prefixed. There are classificatory nominal prefixes and also apparently nominal suffixes. Pluralization is by suffix. The verb employs both prefixes and suffixes.

Bibliography.—Cardus, 1886; Chamberlain, 1910 a, pp. 182–83; Créqui-Montfort and Rivet, 1913 f; Gillin, 1940; Heath, E., 1883; Métraux, 1942 a, p. 81; Orbigny, 1839, p. 80; Pauly, 1928, p. 171; Teza, 1868.

CAYUVAVAN

Synonyms: *Kayubaba*, etc., *Cayuaba, Chacobo.*

Loukotka (1935) saw evidences of *Arawak* intrusion in *Cayuvava* and Markham (1910) considered it a branch of *Mojo*, but there has been no evidence presented for its wider relationships. Créqui-Montfort and Rivet (1920) found some lexical resemblance to *Guaicurú* but not enough on which to assume any relationship; some, but even less resemblance was found to *Tuyoneiri*, *Canichana*, and *Movima.*

A few hundred words are known in seven collected vocabularies, and a few short texts. The nominal plural is by means of a prefix, much similar to that in *Movima.* Also like *Movima*, there is an article or indefinite demonstrative. Pronominal possession is by prefixation; prepositions are also prefixed. Both verbal and nominal prefixes and suffixes are employed.

Bibliography.—Adelung and Vater, 1806–17; Cardus, 1886, pp. 315–316; Chamberlain, 1910 a, pp. 182–184; Créqui-Montfort and Rivet, 1917–20; Heath, E., 1883; Métraux, 1942 a, p. 83; Nordenskiöld, 1911 b, pp. 231–232, 235–239, 241; Orbigny, 1839; Teza, 1868.

MOVIMAN

This small one-language family is of doubtful validity, but on the basis of the not-too-large available lexical data it has been accorded independent status by all from Chamberlain (1913 a) and Brinton (1891 a) down. No synonyms for the group except minor orthographical variants have been used in the literature. Markham (1910) considers it a branch of the *Mojo* (*Arawak*); relationship with the neighboring *Canichana* might be suspected. There are few if any speakers left.

Bibliography.—Adelung and Vater, 1806–17; Cardus, 1886, p. 516; Chamberlain, 1910 a, pp. 192–193; Créqui-Montfort and Rivet, 1914–19; Métraux, 1942 a, p. 81; Nordenskiöld, 1922, pp. 76–77; Orbigny, 1839; Pauly, 1928, pp. 162–163; Rivet, 1929 b.

MOSETENAN

A small "family" of doubtful validity that will probably be incorporated in some larger group when more careful studies are made and/or more data available. Up until the present all authorities have granted it independent position and none has even hinted at broader relationships. Métraux suggests personally that a comparison with *Yuracare* might prove significant. It consists of two main languages, *Moseten* and *Chimane.* A number of affiliated groups are mentioned in the literature, but it is not certain how these are related, which ones are synonyms, or whether the linguistic divergences are on a dialectic level or greater. There are probably a few *Moseten* left, and several thousand *Chimane.*

MOSETEN

1. *Moseten*
    a. *Amo*
    b. *Aparono*
    c. *Cunana*
    d. *Chumpa*
    e. *Magdaleno*
    f. *Punnucana*
    g. *Rache*
    h. *Muchanes*
    i. *Tucupi*
2. *Chimane*
    a. *Chimaniza*
    b. *Chumano*
    c. *Nawazi-Montji*

Bibliography.—Armentia, 1888, 1903; Bibolotti, 1917; Cardus, 1886, pp. 310–311; Chamberlain, 1910 a, p. 192; Groeteken, 1907; Métraux, 1942 a, pp. 15–17; Pauly, 1928, pp. 104–105; Schuller, 1916.

LECAN

Synonyms: *Leko, Leka, Lapalapa, Chuncho, Ateniano.*

The small *Leco* group has been accepted as independent at least since Chamberlain's day (1910 a). Brinton (1892 a), lacking any lexical material, at first placed them with *Tacanan* on geographical grounds. The language is called *Lapalapa.* It seems to have been the language spoken at the mission of *Aten,* whence the natives were referred to as *Atenianos;* the latter are sometimes considered a subgroup of *Leco;* otherwise there are no subdivisions of the family. D'Orbigny (1839) classified the *Ateniano* as *Tacanan.* Markham (1910) called them *Mositen* (*Moseten,* q. v.). Probably a few hundred still survive.

Bibliography.—Brinton, 1892 a; Cardus, 1886, p. 314; Chamberlain, 1910 a, p. 190; Lafone-Quevedo, 1905; Métraux, 1942 a, pp. 27–29; Orbigny, 1839.

YURACAREAN

Synonyms: *Yurukare, Yurujure, Yuruyure*, etc.

Modern writers prefer *Yuracare* to the older standard *Yurucare*. Métraux (personal conversation) suggests that a comparison with *Moseten* might prove fruitful. Markham (1910) considered them a branch of the *Chiquito;* Loukotka (1935) sees *Pano* vestiges. However, no evidence for wider relationships has ever been presented though, like the other independent (?) small languages in this region, its isolated status is doubted and will probably eventually be disproved.

Though most authorities mention no subdivisions, the *Yuracare* are said to be divided into two main subgroups, probably of the status of languages, the eastern and the western. Their components are probably of dialectic quality.

YURACARE

1. East
    a. *Soloto* (*Mage*)
2. West
    a. *Mansinyo*
    b. *Oromo*

Possibly: *Coni, Cuchi, Enete* (Brinton, 1891.)

Bibliography.—Cardus, 1886, pp. 314–315; Castillo, 1906; Chamberlain, 1910 a; Cueva, 1893; Holter, 1877; Ludewig, 1858; Metraux, 1942 a; Nordenskiöld, 1910 b, 1911 b; Orbigny, 1839; Pauly, 1928, p. 177; Richter, 1928.

SMALL LANGUAGES OF THE BRAZIL-BOLIVIA BORDER

(*Havari, Masáca, Capishaná, Puruborá, Mashibi, etc.*)

Huari, Masáca (*Massaka*), and *Capishaná* (*Kapišaná*) are located very close together on Nimuendajú's map, *Puruborá* (*Buruborá*) nearby. The first three, Nimuendajú considers separate isolated families. He apparently had some notes on the *Capishaná*, but it is practically unknown in ethnological literature.

Huari has long been recognized as independent (Rivet, 1924 a; Pericot y García, 1936; Schmidt, W., 1926; Loukotka, 1935), though it is too small and unimportant to have been known to Brinton (1891 a) and Chamberlain (1913 a). There are few data on it and apparently no component languages of the family. Gillin (1940) doubts its validity, and Métraux herein leaves it unclassified. Levi-Strauss (Handbook, vol. 3, p. 372) apparently considers *Huari* equivalent to *Massaka* (*Masáca*), and both linguistically related to *Buruborá* (*Puruborá*). The latter, *Puruborá*, Loukotka (1935) considers as an independent family, consisting of one language with *Tupí* intrusions. Nimuendajú (map), however, places it in the *Tupí* family.

Koch-Grünberg (1932) published a vocabulary. With the exception of *Huari* and *Masáca* all these groups are too small and unimportant to be mentioned by Rivet (1924 a) and W. Schmidt (1926). Rivet considers *Masáca Arawakan.*

Mashubi (*Mašubi*), also in this general region, was given the status of an independent family by Rivet (1924 a) and accepted by Loukotka (1935, 1939 a). Rivet's opinion is based on a short vocabulary collected by Colonel Fawcett in 1924. This apparently passed into the possession of Nordenskiöld and was examined by Rivet; it seems never to have been published. The "family" is, therefore, of doubtful validity; Nimuendajú does not list it or place it on his map. An independent family should not be posited on such slim evidence.

Kepikiriwat, Sanamaicá, Tuparí, Guaycarú, Aricapu, Yaputi, Aruashí, and *Canoa* are languages occupying tiny areas in a small region. The data on them are few, and they had best be left unclassified pending further information. None is classified by Rivet. Nimuendajú considers *Kepikiriwat, Sanamaicá, Tuparí,* and *Guaycarú* as *Tupí; Aruashí* and *Canoa* he leaves unclassified.

Bibliography.—Koch-Grünberg (*Puruborá*), 1932.

CATUKINAN

Synonyms: *Katokena, Catequina,* etc.

The *Catukina* family is one of rather recent acceptance; Brinton (1891 a) believed that it was a jargon, and Chamberlain (1913 a) did not include it among his families. The name seems to be a descriptive *Tupí* word, not originally a proper name, and thus has been used as the name for a number of different tribes that are, therefore, liable to confusion and must be distinguished. Rivet (1924 a) lists five tribes of this name, most of them of different linguistic affinities, one *Tupí-Guaraní,* one *Arawak,* one *Pano,* and two belonging to the present group. Several of the subtribes, *Catawishí* and *Canamarí,* also have duplicates in other families so that the possibility of confusion is very great. There are *Pano* and *Arawak Canamarí,* and an unclassified *Catawishí,* according to Nimuendajú (map).

The *Catukina* family area is a large one and the component tribes very numerous, but there seems to be no general agreement regarding the grouping of these into languages and dialects. The fullest list seems to be on Nimuendajú's map, with little suggestion as to subgroupings.

Catukina, Canamarí, and *Catawishí* are the most important and best-known languages. The *Katokina of* Spix (Martius, 1867, 2:161–163) belongs with the *Canamarí* of the Juruá. Brinton (1891 a) and Chamberlain (1913 a) mistakenly identified this with the *Katukinaru* of Bach (Church, 1898), a *Tupí Guaraní* language, which probably accounts for Brinton's considering *Catukina* a jargon. If these *Catukina* and *Canamarí* are *Arawak*, they belong to a new and very variant subgroup. The *Katukino* of Marcoy (1867) on the other hand go with the *Catawishí*, and may be identical with the latter.

CATUKINA

1. *Beñ-Dyapá* (*Bendiapa*)
2. *Burue* (*Buruhe*)
3. *Canamari*
4. *Catawishi* (*Hewadie*)
5. *Catukina*
    - a. *Pidá-Dyapá*
    - b. *Kutiá-Dyapá*
6. *Catukino*
7. *Parawa*
8. *Tawari* (*Tauaré*)
    - a. *Cadekili-Dyapá*
    - b. *Wadyo-Paraniñ-Dyapá* (*Kairara*)
9. *Tucun-Dyapá* (*Tucano Dyapa, Mangeroma*)
10. (Miscellaneous)
    - a. *Amena-Dyapá*
    - b. *Cana-Dyapá*
    - c. *Hon-Dyapá*
    - d. *Marö-Dyapá*
    - e. *Ururu-Dyapá*
    - f. *Wiri-Dyapá*

Bibliography.—Brinton, 1898 b; Marcoy, 1867 (1869); Martius, 1867, 2:161–163; Rivet, 1920 b; Tastevin, 1928 a.

CHAPACURAN

The *Chapacuran* (*Čapakura*) family has always been known by orthographical variants of the above name though Chamberlain (1912 c) proposed, but never employed, the alternative *Pawumwa*(*n*). It now includes the former *Itenean* stock of Hervás y Panduro (1800) and the former extinct *Ocoronan* stock; Chamberlain (1913 a) included the latter in his definitive classification, believing that Créqui-Montfort and Rivet's identification (1913 b) of *Ocoronan* and *Chapacuran* needed more proof; this is now generally accepted.

According to Rivet, the extinct *Ocorono* group had been strongly influenced by *Arawak* and especially by *Uro* (q. v.) (Créqui-Montfort and Rivet, 1921, p. 104). Some of the tribes had been previously classified as *Pano*. Loukotka (1935) also finds *Arawak* intrusions in all the languages except *Tora* which he considers mixed with *Carib*. Martius (1867) thought them connected with the Paraguayan *Guache*, a *Guaicurú* group, but Brinton (1891 a, p. 303) sees slight resemblance.

Wanyam (*Huañam*), the modern name for *Pawumwa*, has always been considered a member, and often the most typical member, of

Chapacura, but it has been considered by some a separate linguistic stock (see below).

No definite classification of the *Chapacura* languages and dialects has ever been proposed on a linguistic basis. As usual, it may be assumed that each group named, if not a synonym, had its own dialect, that affiliated groups had closely related languages, and that the linguistic divisions roughly followed the geographical ones. On this basis three main divisions might be proposed, the languages of the Guaporé River Basin, those of the Madeira River Basin, and the extinct *Ocorono* group.

If they are *Chapacuran*, *Wanyam*, and *Cabishi* belong in the Guaporé group. The languages or dialects of the Madeira River group cannot be very variant, as they are said to have moved there in post-Columbian days.

Arikêm (*Ariqueme*, *Ahopovo*) (q. v.) is generally considered in this group, but the language seems to be very different from the others; Loukotka (1935) gives it an independent family, and Nimuendajú (map) and Jijón y Caamaño (1941–43) apparently consider it *Tupí*.

CHAPACURA

- I. Guaporé Division
    - A. *Chapacura* Group (*Huachi*, *Guarayo*, etc.)
        - 1. *Chapacura*
        - 2. *Kitemoca*
            - a. *Napeca*
        - 3. *Moré* (*Iten*)
            - a. *Itoreauhip*
    - B. *Wanyam*[1] (*Pawumwa*)
        - 1. *Wanyam*
        - 2. *Cabishí*
- II. Madeira Division
    - 1. *Torá* (*Toraz*)
    - 2. *Jarú*
    - 3. *Urupá*
    - 4. *Pacas Novas*
- III. *Ocorono* Division
    - A. *Ocorono* (*Rokorona*)
        - 1. *Sansimoniano*[2] (?)
    - B. *San Ignacio*
        - 1. *Borja*
    - C. *Herisobocona*

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[1] See following separate section on these.

[2] Jijón y Caamaño places *Sansimoniano* under *Chiquitoan*.

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Undifferentiated.—Cardus, 1886, p. 320; Chamberlain, 1910 a, p. 184; Créqui-Montfort and Rivet, 1913 b; Métraux, 1940, 1942 a, pp. 86–95; Nordenskiöld, 1915 b; Orbigny, 1839, p. 164; Pauly, 1928, pp. 168–169; Snethlage, E. H., 1931; Teza, 1868.

Guaporé division.—Cardus, 1886, p. 320; Chamberlain, 1910 a, pp. 188–189; Créqui-Montfort and Rivet, 1913 b; Orbigny, 1839; Pauly, 1928, pp. 168–169.

Madeira division.—Nimuendajú, 1925, pp. 137–140, 148–159; Nimuendajú and Valle Bentes, 1923, p. 217.

Ocorono division.—Chamberlain, 1910 a, pp. 193–194; Créqui-Montfort and Rivet, 1913 b, pp. 169–171; Snethlage, E. H., 1936.

WANYAM (HUAÑAM) AND CABISHÍ (KABIČI)

Wanyam seems to be the rediscovered *Pawumwa*, and the name has displaced the latter. To date they have always been considered one of the Guaporé *Chapacuran* groups, and are accepted by Métraux (Handbook, vol. 3, p. 398) and by Nimuendajú (map) as such. The latter considers *Abitana Wanyam* a subdivision, the former a synonym. However, Lévi-Strauss who pursued studies in their region, believed in a *Huanyam* linguistic stock, consisting of *Mataua Cujuna* (*Cuijana*), *Urunamakan*, *Cabishí*, *Cumaná*, Snethlage's *Abitana-Huanyam*, and Haseman's *Pawumwa*. Only the last four are at all known to science, and the last two probably constitute one group. All of these are generally considered as *Chapacura*, with the exception of *Cabishí*, which name seems to be applied to several groups of different linguistic affiliations. (See *Nambicuara*.)

WANYAM

1. *Cabishí*[1]
2. *Cujuna*
3. *Cumaná*
    a. *Cutianá*
4. *Matama* (*Matawa*)
5. *Urunamacan*
6. *Pawumwa*
    a. *Abitana Wanyam*

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[1] Rivet (1924 a) considers *Cabishí* as *Nambicuara;* Schmidt (1926) (*Paressí-Kabicí*), *Arawak;* Nimuendajú, *Nambicuara* or *Chapacura*. There may be several groups of *Cabishí*.

Bibliography.—Chamberlain, 1912 c; Créqui-Montfort and Rivet, 1913 b, pp. 141–68; Haseman, 1912; Snethlage, E. H., 1931.

MASCOIAN

A confusion of identities and of groups of the same names but of different linguistic affinities characterizes this family, which consists of one language. Ehrenreich first used the name *Machicui* or *Muscovi;* Koch-Grünberg (1902 a), *Mascoi*. Boggiani (1900) called them *Enimagá*, confusing them with the true *Enimagá* (*Cochabot*, q. v.), which name was applied to the *Mascoi* family by Chamberlain (1913 a) and by Brinton (1898 a). To avoid further confusion the *Enimagá* are now termed *Macá* (q. v.). One of the constituent dialects is the *Lengua*. These are the "new" *Lengua*, the *Lengua* of W. B. Grubb (1911); the "old" *Lengua* are a *Macá* (*Enimagá*) *group*.

D'Orbigny (1839) insisted that the *Mascoi* were *Guaicurú*, like the *Toba*, but Lafone-Quevedo (1896–97) compared the vocabulary with *Abipon* with a negative conclusion. Brinton (1898 a) found a few similarities to *Chon*.

There is practically no difference of opinion regarding the components of *Mascoi*, six scarcely differentiated dialects, except that W. Schmidt (1926) includes *Suhín* (*Sujén*, *Suxén*), a neighboring language, generally classed as *Mataco* and connected with *Ashluslay*, and *Toosle* (*Towothli*), now placed with *Macá* (*Enimagá*). Nimuendajú (map) differentiates *Angaité* from *Enenslet*, *Machicuy* from *Mascoi;* by others they are considered synonyms. Métraux (Handbook, vol. 1, p. 227) mentions the following extinct groups that may have been either *Mascoi*, or *Arawakan Guaná: Guatata*, *Nohaague*, *Empirú*, *Yaperú* or *Apirú*, and *Naperú*.

MASCOI

1. *Angaité*
    a. *Enenslet*
2. *Caskihá* (*Guaná*[1])
3. *Lengua*[2] (*Gecoinlahaac*)
4. *Mascoi*
    a. *Machicui* (*Tujetge*)
5. *Sanapaná*
6. *Sapukí*

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[1] Distinguish *Mascoi* and *Arawak Guaná*.

[2] Distinguish *Mascoi* and *Macá Lengua*.

Bibliography.—Baldus, 1931; Boggiani, 1900; Brinton, 1898 a; Cardus, 1886, p. 271; Cominges, 1892, p. 245; Coryn, 1922; Ehrenreich, 1891; Grubb, W. B., 1911, pp. 318–321; Hunt, 1917; Kersten, 1905; Koch-Grünberg, 1902 a; Lafone-Quevedo, 1896–97; Loukotka, 1930; Orbigny, 1839.

ZAMUCOAN

The *Zamuco* (*Samucan*) "stock" occupies a relatively small area in the northern Chaco. The people and their languages are of slight cultural importance and little known, few in number and disappearing, though the names of a large number of groups are known, many of them extinct. No other name has ever been applied to the group. The differentiation between the component languages and dialects seems to be relatively slight. Brinton (1898 a) pointed out many lexical resemblances with *Arawak* but refused to posit any genetic relationship; the common elements may be largely due to borrowing. Métraux personally suggests that a comparison of *Zamuco* with *Bororo-Otuque* might prove significant, and, as in the case of most small groups at present considered independent, an intensive study will probably tie it to some large family or phylum.

The grouping and subclassification of the languages and dialects are uncertain since the various authorities, as usual, do not agree. That adopted below follows Métraux (Handbook, vol. 1, pp. 241–245) so far as possible. Even the major divisions, apparently, do not differ greatly, and some of the names may be synonyms, or merely bands without linguistic differentiation.

The language is reported to be mellifluous.

ZAMUCO

I. North: *Zamuco*
  A. *Zamuco*
    1. *Zamuco* (*Samuca*)
    2. *Satienyo* (*Zatieño, Ibiraya*)
  B. *Morotoco* (*Coroino*)
    1. *Cucarate* (*Kukutade*)
    2. *Orebate* (*Ororebate*)
      a. *Carerá*
    3. *Panono* (*Panana*)
    4. *Tomoeno*
  C. *Guaranyoca* (*Guarañoca*)
    1. *Tsiracua* (*Empelota*)
      a. *Moro* (remnants of *Morotoco* and *Guarañoca*)
  D. *Ugaranyo* (*Ugaroño*)
    1. *Ugaranyo*
  E. *Tapii* (*Tapio*) (?) [1]
  F. *Poturero* (*Ninaguilá, Ninaquiguila*)
II. South: *Chamacoco*
  A. *Chamacoco* (*Tumanahá, Timinihá*)
    1. *Ebidoso*
    2. *Horio* (*Ishira*)
    3. *Tumerehã*
  B. *Imono*
  C. *Tunacho* (*Tunaca*)
  D. *Caipotorade*

Also (Nimuendajú map): Aguiteguedichagá, Laipisi.

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[1] The *Tapii* may have been *Otukean*.

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Zamuco.—Baldus, 1932; Brinton, 1898 a; Huonder, 1902; Kersten, 1905, pp. 64–66; Loukotka, 1931 a; Nordenskiöld, 1912, p. 324; Oefner, 1942; Orbigny, 1839, p. 164; Steinen, 1912.

Chamacoco.—Baldus, 1927; Belaieff, 1937; Boggiani, 1894, 1929; Cardus, 1886, p. 327; Loukotka, 1929–30, 1930, pp. 560–572; Steinen, 1895.

GUATOAN

No question has ever been raised regarding the independence of the *Guató*; no suggestion has been made of relationship with any other group. No linguistic subdivisions are known, but the *Guaxarapo* (*Guachi*) are always associated with them. (See Métraux, Handbook, vol. 1, pp. 214, 225, 409.) The *Guató* verge on extinction. The principal source is Max Schmidt (1914 b).

Bibliography.—Castelnau, 1852, pp. 283–284; Chamberlain, 1913 c; Koslowsky, 1895; Martius, 1867, 2:209–210; Monoyer, 1905; Schmidt, M., 1902, 1905, 1912, 1914 b.

BOROROAN AND OTUKE

The *Bororo* and the *Otuque* (*Otuké*, *Otuqui*) were long considered separate and independent, and the former was once thought a *Tupí* tongue (Brinton, 1891 a). Cogent arguments for their linkage were presented (Créqui-Montfort and Rivet, 1912, 1913 a) and all recent authorities have linked them, either under the name *Bororo* or *Otuque*. Métraux, however, is not convinced of the connection, and it needs further study and corroboration. The *Otuque* are probably extinct. Two, possibly four, extinct languages, formerly given independent status, *Covareca* and *Curuminaca*, and possibly *Corabeca*, *Curave*, and *Curucaneca* (q. v.), compose, with *Otuque*, the *Otuquean* group. Brinton (1891 a) noted a distant resemblance to *Tacana*. *Bororo-Otuke* will probably eventually be incorporated in some larger phylum. Métraux suggests that a comparison with *Zamuco-Chamacoco* might prove significant. The *Bororo* are sometimes known as *Coroado*, a name applied to a number of different groups, especially of *Ge* and *Macro-Ge*, from which they must be distinguished.

BOROTUKE [1]

- I. *Bororo* (*Coroado*)
    - A. *Bororo*
        - 1. Eastern
            - a. *Orarimugudoge*
        - 2. Western
            - a. *Cabasal*
            - b. *Campanya*
        - 3. *Acioné*
        - 4. *Aravira*
        - 5. *Biriuné*
        - 6. *Coroa* (?)
        - 7. *Coxipo* (?)
    - B. *Umotina* (*Barbado*)
- II. *Otuké*
    - A. *Otuké*
    - B. *Covareca* [2]
    - C. *Curuminaca* [2]
    - D. *Coraveca* (?) [2]
        - 1. *Curavé* (?) [2]
    - E. *Curucaneca* (?) [2]
    - F. *Tapii* (?) [3]

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[1] Hybrid name suggested here for group of *Bororo-Otuke*.

[2] See following section.

[3] The *Tapii* may have been *Otukean* or *Zamucoan*.

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Bororo.—Anonymous, 1908, 1919 a; Caldas, 1899, 1903; Castelnau, 1852, pp. 285–286; Chamberlain, 1912 b; Colbacchini, n. d., 1925; Colbacchini and Albisetti, 1942; Frič and Radin, 1906; Magalhães, 1919; Martius, 1867, 2: 14–15; Steinen, 1894, pp. 545–547; Tonelli, 1927, 1928; Trombetti, 1925.

Umotina.—Schmidt, M., 1929 a, 1941.

Otuke.—Chamberlain, 1910 a; Créqui-Montfort and Rivet, 1912, 1913 a; Orbigny, 1839.

CORAVECA AND COVARECA; CURUCANECA AND CURUMINACA

The similar names in these two groups are not metathesized synonyms. In close geographic propinquity, some close relationship would seem indicated, but the available vocabularies on these extinct languages indicate that the four are separate and very different. In the older classifications all four were considered as independent families. Some authorities, such as Créqui-Montfort and Rivet (1912, 1913 a), place all under *Bororo* or *Otuké* (q. v.). The inclusion of *Covareca* and *Curuminaca* is generally accepted, but *Coraveca* (*Curave*) and *Curucaneca* (*Curucane*), showing less resemblance to *Otuké*, are included with hesitation or reservations, left unclassified, or awarded independent status. By some, *Curave* and *Coraveca* are considered as separate, not as synonymous. The arguments for the inclusion of *Covareca* and *Curuminaca* in the *Otuké* family have been published (Créqui-Montfort and Rivet, 1913 a), but not those for *Curave* and *Corabeca*, *Curucaneca* and *Tapii*. The languages are all in the *Chiquito* region, but no *Chiquito* connections have been suggested, although all four groups are said to have spoken *Chiquito* a century ago (Métraux, Handbook, vol. 3, p. 381). The names of many groups in this region have a similar ring: *Saraveca*, *Paiconeca*, *Paunaca* (*Arawak*), *Kitemoca* (*Chapacura*), *Waranyoca* (*Zamuco*), etc. The four languages in question may be closely related, the recorded vocabularies at fault, but as they are extinct their degree of relationship will probably never be known. (See *Otuké-Bororo* for table.)

Bibliography.—Chamberlain, 1910 a; Créqui-Montfort and Rivet, 1912, 1913 a.

NAMBICUARAN

The relatively recently discovered *Nambicuara* were unknown to and not classified by the earlier authorities; they and their languages have recently been studied carefully by Claude Lévi-Strauss. No detailed comparisons with other linguistic families have been made, but Lévi-Strauss states that the logical structure is much like *Chibcha*, with also some similarities in vocabulary, but nothing conclusive. Loukotka (1935) sees vestiges of several eastern Brazilian languages in several of the component *Nambicuara* languages but nothing that characterizes the family as a whole. The outstanding characteristic of the group according to Lévi-Strauss (personal correspondence) is an extensive use of classificatory suffixes dividing things and beings into about 10 categories.

According to Lévi-Strauss (personal correspondence), the classification of the *Nambicuara* languages by Roquette-Pinto (1917) is not good. There are two main groups, the *Nambicuara* Proper and the pseudo-*Nambicuara*. The latter, northern group, the *Sabane*, never before mentioned in literature, is considerably different from the other languages in structure and has a vocabulary rich in *Arawakan* elements probably borrowed from the *Paressí*. It may be found to belong to some other, or to be a new linguistic family.

The *Nambicuara* Proper are divided into two languages and each of these into two dialects, as shown in the following table. The endings of words is the only difference between the *Cocozú* and *Anunzé* dialects. The *Tamaindé* vocabulary of Max Schmidt (1929 a, p. 102) belongs to the western dialect, characterized by a new form for the verbal suffix.

In addition to orthographical synonyms, such as *Nambikwara*, they are known as *Mambyuara*, *Mahibarez*, and *Uaikoakore;* the dialect names have also many orthographical variants. A few groups not mentioned by Lévi-Strauss are included in the *Nambicuara* family by some of the other authorities, sometimes by several of them, and contradicted by none. These are *Salumá*, *Nênê*, *Congoré*, and *Navaité;* some of them may be synonyms. Métraux suggests the possible inclusion of *Guayuakuré* and *Tapanhuana*, apparently little-known groups.

NAMBICUARA

I. *Nambicuara* Proper
    A. Northeastern
        1. Eastern
            a. *Cocozu*
        2. Northeastern
            b. *Anunzé*
    B. Southwestern
        1. Central and Southern
            a. *Uaintazu*
            b. *Kabishi*
            c. *Tagnani*
            d. *Tauité*
            e. *Tarutė*
            f. *Tashuité*
        2. Western
            a. *Tamaindé*
II. *Pseudo-Nambicuara*
    A. Northern
        1. *Sabane*

Bibliography.—Rondón, 1910, pp. 52–53; Roquette-Pinto, 1912, 1917, 1935; Schmidt, M., 1929 a; Schuller, 1921; Souza, A., 1920.

CABISHÍ

Cabishí is one of those names applied to a number of different tribes. Authorities such as Nimuendajú and Rivet seem to agree that the true *Cabishí* are a branch of the *Nambicuara*, and Nimuendajú equates the term with *Waintazú* (*Uaintaçú*). Another *Cabishí* are a branch of the *Wanyam*. (See *Chapacura*.) The *Paressí-Cabishí* are *Arawak* (q. v.). The name *Cabishiana* (*Kabixiana*, *Kapišana*, q. v.) is probably related.

MURAN

A moderately small group, *Mura* is considered as forming an independent linguistic family by all modern authorities except Brinton (1891 a). He states that the majority of its words are from *Tupí* roots; as his opinions—and often his guesses—are generally good, and as no other authority has noted this resemblance, we may suspect that the vocabulary that he used was unsuitable in this connection. No other suggestions regarding larger relationships have been made, though Loukotka (1935) finds vestiges or intrusions of *Camacan* and *Caingang*—an unlikely possibility.

The *Mura* family may consist of two main divisions, *Mura* Proper and *Matanawí* or *Matanauy* (q. v.). But the latter is so divergent that Nimuendajú (map) considers it isolated. *Mura* Proper is divided into three "dialects," those of *Bohurá*, *Pirahá*, and *Yahahi*. (See Nimuendajú, Handbook, vol. 3, pp. 255–258.)

Mura must not be confused with the Bolivian (Chapacuran ?) *Mure*.

Mura

A. *Bohurá*
B. *Pirahá*
C. *Yahahi*

Bibliography.—Chamberlain, 1910 a; Martius, 1867, 2: 20–21; Nimuendajú, 1925, 1932 a; Nimuendajú and Valle Bentes, 1923.

MATANAWÍ

Rivet (1924 a), who uses the spelling *Matanauy*, Loukotka (1935, 1939 a), and Jijón y Caamaño (1941–43) place *Matanawí* in the *Mura* family; Loukotka sees *Caingang* intrusions. But Nimuendajú (map and linguistic index), whose vocabulary (1925, pp. 161–171) seems to be the basic source, prefers to list it among his "isolated languages."

Bibliography.—Nimuendajú, 1925, pp. 143, 166–171; Nimuendajú and Valle Bentes, 1923, p. 222.

TRUMAIAN

Trumai has been accepted as independent ever since its discovery by Von den Steinen. No suggestion as to larger affiliations has ever been made. The linguistic data, however, are few, and when it is better known an attachment to some larger family is likely. A single language composes the "family."

Bibliography.—Chamberlain, 1910 a; Steinen, 1894, pp. 540–542.

CARAJÁN

Synonyms: *Carayá, Karayá, Karadžá.*

Universally recognized as an independent family, at least since the days of Brinton (1891 a) and Chamberlain (1913 a), no other variant synonym has ever been proposed for the stock. Lipkind (vol. 3, p. 179), who has recently recorded and studied it, says it is unrelated to at least the four great families of *Arawak*, *Carib*, *Tupí*, and *Ge*. The speech of men and women differ. Brinton (1891 a, p. 261) found a little lexical resemblance to "*Tapuya*" (*Ge*), which may probably be ascribed to borrowing.

While no classificatory subdivisions of the family have been proposed, there is general agreement that *Carajá* (see same synonyms as for family) or *Karayaki* (*Carajahi*), *Yavahé* (*Yavahai, Javahé, Javahai, Zavažé, Shavayé, Jawagé*), and *Shambioá* (*Schambioá, Šambioá, Chimbioá, Ximbioá*) are the principal component languages. Linguistic differences in the three are slight and on a dialectic level (Lipkind, Handbook, vol. 3, p. 179). W. Schmidt (1926) also includes *Asurini* (probably *Tupian*). Brinton (1891 a) distinguishes *Carajahi* from *Carajá*. Nimuendajú (map) distinguishes from the *Carajá* of the *Araguaya* an earlier unclassified extinct group of the same name in Minas Gerais, possibly ancestral.

CARAJÁ

1. *Carajá* (*Karayá*)
    a. *Carayahi*
2. *Yavahé* (*Shavaye*)
3. *Shambioá*

Bibliography.—Castelnau, 1852, pp. 268–269; Chamberlain, 1913 c; Coudreau, H., 1897 b, pp. 259–270; Ehrenreich, 1888, 1894–95, pp. 20–37; Krause, 1911, pp. 458–469; Kunike, 1916, 1919; Martius, 1867, 2: 264–266.

CARIRIAN

Synonyms: *Kariri, Kairiri, Cairiri, Kayriri, Kiriri, Cayriri.*

Cariri has always been recognized as an independent family. The suggestion has been made that it belongs with the great *Carib* stock (Gillin, 1940), but no evidence in support has been offered. As a grammar (Mamiani, 1877) and other studies on the language (Adam, 1897) have been published, the determination should not be difficult. The family is on the verge of extinction; the few remnants of *Camurú* probably do not use their language in its former purity.

The linguistic subdivisions of the family seem to be:

A. *Cariri*
    1. *Kipea*
    2. *Camurú*
    3. *Dzubucua*
    4. *Pedra Branca*
B. *Sapuya*

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Cariri.—Adam, 1878, 1897 a; Bernard de Nantes, 1896; Chamberlain, 1913 c; Gillin, 1940; de Goeje, 1932, 1934; Mamiani, 1877; Martius, 1867, 2: 215–217; Mitre, 1909–10; Pompeu Sobrinho, 1928, 1934.

Sabuya.—Adelung and Vater, 1806–17; Martius, 1867, 2: 218–219.

MACRO-GE

Macro-Ge is a term here proposed for the first time as an equivalent for the *Ge* or "*Tapuya* stock" or "family" as constituted until recent years, synonymous with Rivet's (1924 a) *Že* and W. Schmidt's (1926) *Ges-Tapuya*. As herein conceived, it consists of *Ge* and some eight other "families," "stocks," or languages, formerly considered as members of the great *Ge* family, which some recent authorities suggest as independent. Future research will have to give the final decision as to their independence; they are herein considered as far from proved. There is considerable lexical resemblance, which may or may not be a result of borrowing. Had these languages always been considered independent, articles would certainly have been written to prove their relationship with *Ge*, as cogent, and as convincing or unconvincing, as many others linking other groups, formerly considered independent, with larger entities. It may eventually be decided that some of these languages are independent, but it is more likely that other small languages will be added to make *Macro-Ge* an even more inclusive phylum.

Rivet (1924 a, p. 697) summarized the *Ge* situation well in his remarks:

> This family, of all the South American families, is the one most artificially constituted. It is the *caput mortuum* of South American linguistics. Its careful and complete revision, on truly scientific grounds, is imperative.

Rivet, who made researches on most of the South American families, left *Ge* severely alone. Loukotka took up the problem and, with his usual "radical conservatism," split the old *Ge* into nine independent families: *Žé* (*Ge*); *Kaingán* (*Caingang*); *Kamakán* (*Camacan*); *Mašakalí* (*Mashacalí*); *Coroado; Patašó* (*Patasho*); *Botocudo; Opaié* (*Opayé*);

Iaté (*Fornio, Fulnio*). He sees *Ge* "intrusions" in all but the first and last. In his earlier studies Loukotka retained *Caingang* under *Ge* Proper, but finally (1935, 1939 a) decided to separate this also. It was his intention to publish a monograph on each of these new families, with large comparative vocabularies, written in the same pattern, but to date he has published on only *Mashacalí* (1931–32 a), *Camacán* (1931–32 b), *Coroado* (1937), and *Patasho* (1939 c).

Nimuendajú and Lowie herein accept all these components as independent from *Ge* Proper, either as families or as isolated languages, with the exception of *Caingang*, which they still consider as a member of *Ge* Proper. Herein *Caingang* (q. v.) is considered as separate from *Ge* Proper as the other components of *Macro-Ge*.

As conceived herein, *Macro-Ge* consists of nine groups or families as follows: (1) *Ge;* (2) *Caingang;* (3) *Camacán;* (4) *Mashacalí;* (5) *Purí;* (6) *Patashó;* (7) *Malalí;* (8) *Coropó;* and (9) *Botocudo.*

It will be noted that, in addition to orthographic variations, this list, while equal in number to Loukotka's, differs slightly. The name *Purí* is preferred to *Coroado*. *Malalí* and *Coropó* have been added because their classification in some one of the other groups is so uncertain. As regards Loukotka's last two, *Opayé* and *Iaté* (*Fornio*), the resemblance to any *Ge* language seems to be so slight that they are better considered for the present as independent and non-*Ge*.

Of the nine above, Nimuendajú considers *Ge*, *Camacán*, *Mashacalí*, *Purí*, and *Botocudo* as "stocks"; *Patashó* and *Malalí* as "isolated"; *Caingang* he places under *Ge;* and *Coropó* with *Purí*.

Apparently all the *Macro-Ge* groups were termed "*Tapuya*" (enemies) by the *Tupí*, and this name was formerly used as a synonym for *Ge*. They inhabit the infertile regions of eastern Brazil, off the rivers. From the coast they were displaced by the *Tupí*. Somatological and cultural evidence suggests that they were among the most autochthonous of all South American natives; as such it is unlikely that any connections will be found with other great families or phyla. As languages of people of low culture they have been neglected more than their scientific importance warrants, and the morphologies are not well known. They are said to be phonetically difficult, and harsh. Except for the *Ge* Proper and the *Caingang*, most of them were close to the Brazilian coast; most of them are now extinct, and the others practically so.

GE

The *Ge* group, as herein recognized, consists only of the *Ge* Proper, one section of the *Ge* family as previously constituted, which latter is herein termed *Macro-Ge* (q. v.). That is, a number of other groups, *Mashacalí, Camacán*, etc., formerly considered as constituting the *Ge* family, have been removed from it and, together with *Ge* proper, considered as constituent parts of the phylum *Macro-Ge*. The *Ge* occupy a solid large area in eastern Brazil. They were displaced in some regions by the *Tupí*, and the language is losing ground to modern Brazilian Portuguese. They were formerly known as "*Tapuya*," the *Tupí* word for "enemy." *Cran* or *Gueren*, meaning "ancients" or "natives," is another synonym; their self-name is *Nac-nanuc*. Many of the names of groups end in *zhe* (*Ge*, *Že*).

The classification of the *Ge* languages here presented is taken primarily from Lowie and Métraux (Handbook, vols. 1 and 3). These, however, are probably based principally on present political association, cultural resemblance, and geographical propinquity rather than on linguistic grounds. A thorough independent study has not been possible, but a brief comparison of vocabularies of a few of the better-known *Ge* languages suggests that a truer picture of linguistic relationships may cut across the proposed divisions. This short study indicates:

A. A rather closely connected group consisting of: *Apinayé*, *Northern* and *Southern Cayapó*, *Carahó*, *Gradahó*, añd *Mecubengocré*.

B. *Ushikring* and *Suyá* are slightly more variant.

C. *Ramcocamecran* and *Aponegicran* probably should also be placed in this group. (All the above languages are in the Northwestern division.)

D. More distantly affiliated: *Shavanté*, *Sherenté*, *Tazé* and *Crenyé*.

E. Possibly affiliated: *Acroa* and *Jeicó*.

F. Of uncertain affiliation: *Mehín*, *Purecamecrán*, *Piokobzé*, *Capiecrán*, *Crao*, *Shicriabá*. (*Crenyé* shows some resemblance to *Crao* and to *Mecubengocré*; *Capiecrán* to *Northern Cayapó*.)

GE

- I. Northwest
  - A. *Timbira*
    - 1. West *Timbira*
      - a. *Apinayé*[1] (*Apinages*)
    - 2. East *Timbira* (*Hoti*)
      - a. Northern
        - *a*. *Gurupy*
        - *b*. *Creyé* (*Crenye*) of Bacabal
        - *c*. *Nucoecamecran* of Bacabal
      - b. Southern
        - *a*. *Canela*:[2] *Apanyecra* (*Aponegicran*), *Kencateye* (*Kencatazé*), *Ramcocamecra* (*Capiecran*)
        - *b*. *Carateye*
        - *c*. *Craho* (*Krao*), *Macamecran*
        - *d*. *Crepumcateye*
        - *e*. *Crenyé* (*Crange*) (of Cajuapara), (*Tažé*)

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[1] Traditionally the *Apinayé* are offshoots of the *Krikatí*. Pericot suggests that they may be the same as the *Aenaguig*, but Lowie considers the latter independent.

[2] *Canela* is the Brazilian name for the savage *Timbira*. Some other groups here listed are considered as *Canela*. Rivet (1924 a) gives as additional *Canela* bands: *Temembú*, *Bucobú*, or *Mannozó*, *Poncatgé*. Some of these may be synonyms of others here listed.

GE—Continued

- I. Northwest—Continued
  - A. *Timbira*—Continued
    - 2. East *Timbira* (*Hoti*)—Continued
      - b. Southern—Continued
        - *f. Cricatí* (*Krikateye, Caracaty, Makraya*)
        - *g. Gaviões*
        - *h. Nyurukwayé* (*Norocoage*)
        - *i. Porekamekra* (*Purecamecran*)
        - *j. Pucobye* (*Piokobžé*)
        - *k. Chacamekra* (*Sacamecran, Matteiro*)
        - *l.* (*Augutge*)
        - *m.* (*Paicoge*)
        - *n.* (*Mehín*)
  - B. *Cayapó*
    - 1. Northern *Cayapó* (*Coroá, Carajá*)
      - a. *Carahó* (*Karahó*)
      - b. *Gorotire*
      - c. *Gradahó* (*Cradahó, Gradaú*)
      - d. *Ira-Amaire*
      - e. *Pau d'Arco*
      - f. *Purucarod* (*Purukaru*)
        - *a. Curupite*
      - g. *Mecubengokre*
      - h. *Ushicring* (*Chicri, Byoré*)
      - i. *Crúatire*
      - j. *Cayamo*
    - 2. Southern *Cayapó*
  - C. *Suyá*
    - 1. *Suyá* (*Tsuvá*)
- II. Central
  - A. *Akwē* (*Acua, Akwa*)
    - 1. *Shacriaba* (*Chikriaba*)
    - 2. *Shavante*[3] (*Chavante, Crisca, Pusciti, Tapacuá*)
    - 3. *Sherenté* (*Cherente*)
  - B. *Acroá*
    - 1. *Acroá*
      - a. Northern
      - b. Southern
    - 2. *Gueguê* (*Goguê*)
- III. *Jeicó* (*Jaicó, Geicó*)
  - A. *Jeicó*

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[3] The name *Shavanté* (q. v.) is applied to a number of different groups. The *Shavanté* included here are those of the Rio dos Mortes. They must be distinguished from the *Otí Chavanté* and the *Opayé Chavanté* (q. v.), of other linguistic affinities. The *Tupí Canoeiro*, the *Timbira Nyurukwaye* and the *Orajoumapré* are also termed *Chavanté*. Other names applied to the *Akwe-Chavanté* are *Crixa* (*Curixa*), *Puxiti*, and *Tapacuá*. *Shavante* and *Sherente* are essentially the same.

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Apinayé.—Castelnau, 1852, p. 270; Hurley, 1932; Leal, 1895, pp. 225–228; Martius, 1867, 2:147–149; Oliveira, C. E. de, 1930, pp. 99–104; Snethlage, E. H., 1931.

Eastern Timbira.—Etienne, 1910 (*Capiecran*); Froes de Abreu, 1931 (*Ramco-*

camecran); Kissenberth, 1911 (*Kencatazé*); Martius, 1867, 1: 525 (*Purucamecran*), 2:149–151 (*Aponezicran*); Nimuendajú, 1914 d (*Crengez, Tazé*), 1915 (*Crenzé, Mehin, Ramcocamecran, Tazé*), 1946 (*Timbira*); Pohl, 1832–37 (*Timbira*); Pompeu Sobrinho, 1930, 1931 (*Canela, Merrime, Mehin*); Sampaio, T., 1912 (*Mecumecran, Crao*); Snethlage, E. H., 1931 (*Ramcocamecran, Crao, Piocobzé*).

Cayapó.—Castelnau, 1852, pp. 273–274 (*Carahó*); Coudreau, H., 1897 b, pp. 271–290; Ehrenreich, 1888, 1894–95 (*Cayapó, Usicring, Gradahó*); Kissenberth, 1911, pp. 53–54 (*Mecubengocré*); Krause, 1911, pp. 461–469; Kupfer, 1870, pp. 254–255; Maria, 1914; Martius, 1867, 2:134–135, 151–152 (*Carahó*); Nimuendajú, 1931–32 pp. 552–567; Pohl, 1832–37, 2:447; Saint Hilaire, 1830–51, 2:108–109; Sala, R. P. A. M., 1920; Socrates, 1892, pp. 95–96.

Suyá.—Steinen, 1886, pp. 357–360.

Central Group.—Castelnau, 1852, pp. 262–268 (*Shavanté, Sherenté*); Ehrenreich, 1894–95 (*Acuá, Shavanté, Sherenté*); Eschwege, 1830, pp. 95–96 (*Shicriabá*); Martius, 1867, 2:139–146 (*Sherenté, Chicriabá, Acroa mirim*); Nimuendajú, 1929 a (*Serenté*); Oliveira, J. F. de, 1913 a, 1913 b (*Sherenté*); Pohl, 1832–37, 2:33 (*Chavanté*); Saint Hilaire, 1830–51, 2:289–290 (*Shicriabá*); Socrates, 1892, pp. 87–96 (*Sherenté*); Vianna, 1928 (*Acuen*).

Geico.—Martius, 1867, 2:143.

"Tapuya."—Barbosa da Faria, 1925; Ehrenreich, 1894–95; Koenigswald, 1908 a; Schuller, 1913 c.

CAINGANG

Caingang, also sometimes called *Guayaná, Coroado, Bugre, Shocleng, Tupí, Botocudo*, etc., is still considered a member of *Ge* Proper by Nimuendajú, Lowie, and Métraux. Loukotka also placed it under Ge until his 1935 classification when he gave it independent status. A perusal of the lexical data indicates that it is at least as different from *Ge* Proper as most of the other components of *Macro-Ge*. Henry (1935) is also of the opinion that *Caingang* should be separated from *Ge*.

Caingang seems to show even less lexical resemblances to *Ge* than do *Mashacalí, Camacán*, and *Purí* (*Coroado*). In spite of the large vocabularies available very few words show any resemblance to words of similar meaning in any of the other families. Nevertheless, as in the comparisons of all of these languages, there are a fair number of possible connections, and a small number of certain, close, or even identical resemblances, generally in common basic words that would not be likely to be borrowed. In spite of the apparent great lexical differences it is probable that *Caingang* is distantly related to all these languages. Though the differences are not great, either qualitatively or quantitatively, *Caingang* seems to show slightly greater resemblance to *Purí*. Loukotka considers the family as showing *Ge* intrusions, and most of the constituent languages to show *Arawak* or *Camacán* vestiges.

Bugre is an opprobrious term; *Botocudo* and *Coroado* are descriptive, and the *Caingang* groups to whom they are applied must be distinguished from the other *Macro-Ge* groups of these names. Few

Caingang languages seem to be extinct. They occupy an interior region coterminous with the *Ge* Proper, not, like the other *Macro-Ge* divisions, a coastal region.

The subdivisions are uncertain and disputed. Loukotka divides them into 10 languages: four dialects of *Caingán, Kadurukré, Kamé, Wayana, Ivitorokai, Ingain,* and *Aweicoma.* The classification of Métraux, herein adopted, is probably based on political and regional groups rather than on linguistic variations, but, nevertheless, gives the impression of greater reliability. According to him, *Cayurucré* (*Kadurukré*) is a moiety; the *Wayaná* (*Guayaná*) were the ancestors of the present *Caingang; Ivitorocai* and *Ingain* are synonyms of *Taven* and *Tain,* and *Aweicoma* a synonym of the more usual term *Shocleng.* There were apparently two groups of *Wayaná,* one speaking *Tupí-Guaraní,* the other ancestors of the *Caingang.*

The best linguistic data are found in Father Mansueto Barcatta Valfloriana, 1918 a, 1920.

CAINGANG

I. *Caingang*
    A. São Paulo (*Coroado*) [1]
        1. *Nyacfateitei*
    B. Paraná
    C. Rio Grande do Sul
II. *Shocleng* (*Socré, Chocré, Xocren, Bugre, Botocudo,*[2] *Aweicoma, Cauuba, Caahans, Caagua, Caaigua* [3])
III. *Taven*
    A. *Tain*
    B. *Ingain* (*Wayana, Guayaná* [4])
        1. *Patte* (*Basa*)
        2. *Chowa*
        3. *Chowaca*
    C. *Ivitorocai*
    D. *Gualacho* (*Coronado* [4])
        1. *Gualachí*
        2. *Chiki*
        3. *Cabelludo*
IV. *Dorin*
    (Bands: Jahuateie, Venharo)
    (Moieties: Cayurucré, Votoro, Camé)
    Possibly *Caingang*: *Aricapú, Yabuti.*[5]

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[1] Distinguish from other *Macro-Ge Coroado* (*Purí*).
[2] Distinguish from other *Macro-Ge Botocudo.*
[3] Distinguish from *Chiriguano* (*Tupí-Guaraní*) *Caaigua.*
[4] Distinguish from *Guaraná Guayaní.* (See Métraux, Handbook, vol. 1, p. 446.)
[5] See Lévi-Strauss (Handbook, vol. 3, p. 372).

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Caingang.—Adam, 1902; Ambrosetti, 1894, 1895 a, pp. 354–87; Anonymous, 1852; Baldus, 1935, pp. 194–201; Barcatta de Valfloriana, 1918 a, 1918 b, 1920;

Borba, 1882, 1908, pp. 95–114; Chagas-Lima, 1842; Freitas, 1910; Henry, 1935, 1948; Hensel, 1869; Ihering, 1895, pp. 117–118, 1904; Martius, 1867, 2:212–214; Moreira-Pinto, 1894, p. 580; Paula-Souza, 1918; Pindorama, 1937; Saint Hilaire, 1830–51, 1:456–457; Taunay, 1888, 1913; Teschauer, 1914, pp. 29–30, 1927, pp. 49–51; Vocabulario Comporado, 1892; Vogt, 1904.

Shocleng Group.—Gensch, 1908; Ihering, 1907, p. 232; Paula, 1924, pp. 131–134.

Guayaná.—Borba, 1908, pp. 138–139; Ihering, 1904; Lista, 1883, pp. 112–113; Martínez, B. T., 1904.

Aricapú, Yabutí.—Snethlage, E. H., 1931.

CAMACÁN, MASHACALÍ, AND PURÍ (COROADO)

On these three groups, formerly considered as members of the great *Ge* family, Loukotka has published linguistic sketches (1931–32 a, 1931–32 b, 1937), including vocabularies compiled from all known sources, and lexical comparisons with *Ge* and other neighboring languages. His deductions are that all are independent from each other and from *Ge*, but with *Ge* "intrusions." All three with their several language divisions are supposed to be extinct, though a few members may still live with other groups in some of the missions. Presumably, therefore, no new linguistic data will be found, and their relationships must be determined on the basis of the material at hand, compiled by Loukotka. Unfortunately, no grammatical studies are known, and the basic data consist of vocabularies of varying size, mainly of rather ancient date and all uncritically recorded. The few phrases afford very little morphological information.

The phonetics of the three groups are similar in general type, and the few morphological deductions made by Loukotka show no great difference; on these grounds the three might be closely related. Lexically, however, they are very different. The compiled vocabularies are large enough to afford sufficient data for tentatively conclusive results, nearly 900 words for the *Coroado* group, about 350 for *Mashacalí* and *Camacán*. Using very uncritical methods of comparison and noting every case of stems showing the slightest resemblance, many of which will doubtless be thrown out when a critical linguistic study is made, Loukotka finds the following proportion of possible stems connected with *Ge* and *Caingang* combined: *Coroado*, 10.7 percent; *Mashacalí*, 12.6 percent; *Camacán*, 17.2 percent.

My reworking of Loukotka's data, eliminating the most improbable of his correspondences, gave the following results:

Camacán showed most resemblance to *Ge* with 37 probable correspondences, 7 of them close; next to *Mashacalí* with 18 probable correspondences, 7 close; and next to *Caingang* with 25 probable correspondences, 2 close. There were 12 probable correspondences to *Botocudo*, 4 close ones. The correspondences with *Iaté*, *Patashó*, and

Opayé are ignored on account of the very slight amount of data on these languages. In spite of the large *Coroado* vocabulary, the largest of all, the correspondences are very few, only 7, with 2 of them close, less than the resemblance to *Iaté*, with 10 probable correspondences. *Camacán* obviously stands in much closer relationship to *Iaté* than to *Coroado*.

The closest resemblance of *Mashacalí*, on the other hand, is about equally to *Coroado*, with 23 probable correspondences, 9 of them close, and to *Ge* with 26 probable correspondences, 8 of them close. Next follows *Camacán*, with 18 probable correspondences, 7 of them close, and then *Caingang* with 20 probable correspondences, 4 of them close.

Coroado has its closest resemblance to *Ge*, with 35 probable correspondences, 17 of them close; with *Caingang*, with 30 correspondences, 9 of them close; next with *Mashacalí* with 23 probable correspondences, 9 of them close; and last with *Botocudo*, with 13 probable correspondences, 3 of them close. The slight resemblance to *Camacán*, a significant point, is noted above.

As may be deduced from the above, *Ge* shows about equal resemblance to *Coroado* and to *Camacán*, the former showing 35 possible correspondences, 17 of them close; *Camacán*, 37 possible correspondences, 7 close (but with a much smaller vocabulary to compare). Next follows *Mashacalí*, with 26 possible correspondences, 8 of them close; and then *Caingang*, with 14 possible correspondences, 6 of them close.

CAMACÁN

The *Camacán* languages are all extinct, all the data being now on record. Loukotka (1931–32 b) has published a monograph on them, giving them independent rank. In this he is followed by Métraux and Nimuendajú (Handbook, vol. 1, p. 547). Rivet (1924 a), W. Schmidt (1926), and earlier authorities considered the group a component of *Ge*. It is here classified as a component of *Macro-Ge* (q. v.). It shows more and closer lexical resemblances to *Ge* Proper, *Mashacalí*, *Caingang*, and *Iaté* than can be explained on grounds of borrowing. Though probably related to *Purí* also, the lexical resemblances are surprisingly slight. The resemblance is about equal to all the *Ge* Proper groups, except to *Suya* and *Jeicó*. The *Camacán* are not an *Acroa* horde, as Martius thought.

There is general agreement as to the languages composing the family. As regards the closer relationships of these languages, there is less agreement. The classification here accepted is based primarily on Métraux and Nimuendajú.

CAMACÁN

I. *Camacán* (*Kamakán*)
    A. *Mongoyó*[1]
    B. *Monshocó* (*Ezeshio*)
II. *Cutashó* (*Kotoxó*)
    A. *Catethoy* (*Katathoy*)[2]
III. *Menián* (*Manyá*)
IV. *Masacará*[3]

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[1] Schuller's identification (1930 a) of *Iaté* or *Fulnio* (q. v.) with *Mongoyó* is certainly based on insufficient evidence. The vocabularies of Etienne and Guimarães are said to be very incorrect plagiarisms of Wied.

[2] No linguistic material on *Catathoy* is extant.

[3] Loukotka (1935) differentiates *Masacará* from the others as a language mixed with *Ge*, though he had earlier termed it merely a slightly variant form of *Camacán* Proper.

Bibliography.—Etienne, 1909 (*Mongoyó*); Guimarães, J. J. da S., 1854 (*Mongoyó*); Ignace, 1912; Loukotka (with complete bibliography), 1931–32 b; Martius, 1867, 2:153–54, 156–158 (*Cotoxo*), 155 (*Meniens*), 144–145 (*Masacará*); Métraux, 1930; Moreira-Pinto, 1894, 1:387; Wied-Neuwied, 1820–21, 2:325–330.

MASHACALÍ

Mashacalí, an extinct language, was first separated from the old inclusive *Ge* by Loukotka, who published the standard monograph upon it (1931–32 a); it is now accepted as an independent family by Métraux and Nimuendajú (Handbook, vol. 1, p. 541). However, it has obvious resemblances with *Ge* and has, therefore, herein been considered one of the members of the *Macro-Ge* phylum. The available data are slight, old, and poor. The resemblance is about equal, and not great, to *Purí* and *Ge* Proper, slightly less to *Camacán* and *Caingang*. In the *Ge* group, *Mashacalí* seems to show the greatest connection with *Cayapó*, the least with *Northern Ge*.

Six "languages" are placed by all authorities in this family, all given equal rank, and no further subdivisions proposed. With regard to three languages, *Malalí*, *Potashó*, and *Coropó*, placed by some in the *Mashacalí* group, there is great difference of opinion. These three are treated separately.

1. *Caposhó* (*Koposǒ*)
2. *Cumanashó* (*Kumanaxó*)
3. *Macuní* (*Makonĩ*)
4. *Mashacalí* (*Maxakarí*)
5. *Monoshó* (*Monoxó*)
6. *Panyame* (*Pañame*)

Bibliography.—Loukotka, 1931–32 a (containing full bibliography); Martius; 1867, 2:169 (*Mashacalí*), 170–172 (*Capoxó*, *Cumanachó*, *Panháme*), 173–176 (*Macuni*); Saint-Hilaire, 1830–51, 1:47 (*Maconi*), 213 (*Mashacalí*), 428–429 (*Monoshó*); Wied-Neuwied, 1820–21, 2:319, 323–325 (*Mashacalí*, *Maconi*).

PURÍ (COROADO)

For this extinct group or family the name *Purí* is preferable to *Coroado*, to avoid confusion with *Caingang* and *Bororo* groups of the same name, which means "crowned" or "tonsured." The group was formerly considered a part of *Ge*, and is herein considered one of the components of *Macro-Ge*. It was separated from *Ge* by Loukotka, the author of the principal monograph upon it (*Coroado*) (1937); Nimuendajú accepts it as independent (*Purí*), as does Métraux (Handbook, vol. 1, p. 523).

The languages are probably extinct but a number of vocabularies are extant, and the lexical data, compiled by Loukotka, amount to some 900 words (including *Coropó*). Lexically, *Purí-Coroado* shows the closest relationship with *Ge* Proper, closest with *Cayapó*, least with *Suyá*, about equal with *Northern* and *Eastern Ge*, little with *Jeicó*. Resemblances with the *Caingang* and *Mashacalí* groups are a little less and about equal. The lack of resemblance to *Camacán* is significant.

A century ago, the *Coroado* remembered when they formed a single group with the *Purí*; the differences between them must, therefore, be in the degree of dialects, that of their component bands even less. *Purí* and *Coroado* are the only certain members of the group. Other proposed members are *Coropó* and *Waitacá* (*Guaitaka*, *Goyataca*). These are treated separately herein, for reasons there given. Métraux herein (Handbook, vol. 1, p. 523) considers *Coropó* related.

PURÍ (COROADO)

I. *Coroado*
    A. *Maritong*
    B. *Cobanipake*
    C. *Tamprun*
    D. *Sasaricon*
II. *Purí*
    A. *Sabonan*
    B. *Wambori*
    C. *Shamishuna*

Bibliography.—Ehrenreich, 1886; Eschwege, 1818, pp. 165–171, 1830, pp. 233–243; Loukotka, 1937 (full bibliography); Martius, 1867, 2:194–207; Noronha Torrezão, 1889; Reye, 1884, pp. 99–101; Saint-Hilaire, 1830–51, 1:46–47; Wied-Neuwied, 1820–21.

PATASHÓ

The classification of *Patashó* is most uncertain. The older classifications of Rivet (1924 a) and W. Schmidt (1926) placed it in the *Mashacalí* group of *Ge*. Loukotka (1935) separated it and gave it independent rank on an equal footing with *Mashacalí;* in this he is followed by Métraux and Nimuendajú. Métraux and Nimuendajú say (Handbook, vol. 1, p. 54) that Nimuendajú found a close relationship between his *Patashó* and *Mashacalí* vocabularies, but that Wied-Neuwied's *Patashó* and Saint-Hilaire's *Mashacalí* vocabularies are very different.

An independent reworking of Loukotka's published comparative material left the present author doubtful of the *Macro-Ge* relationship of *Patashó*. A brief comparison of Wied-Neuwied's *Patashó* vocabulary (1820–21), however, showed a marked resemblance to *Mashacalí*, and considerable to *Coropó* (q. v.), but little to *Ge* proper. Some 20 of the *Patashó* words show apparent connections with *Mashacalí*, and more than half of these are very close, and mainly in words not likely to have been borrowed. The inclusion of *Patashó* in the *Mashacalí* group or family thus seems to be strongly indicated. However, it is quite possible that the vocabularies showing this resemblance are somehow faulty in ascription, and the example of Nimuendajú and Loukotka have been followed herein in leaving *Patashó* apart as a separate member of *Macro-Ge*.

Patashó may not be entirely extinct. No grammar or linguistic study is known. The standard vocabulary by Wied consists of only 90 words, but Loukotka possesses an unpublished study, and apparently Nimuendajú also had unpublished material.

Bibliography.—Ehrenreich, 1891, 1894–95; Loukotka, 1939 c (full bibliography); Martius, 1867, 2:172–173; Métraux, 1930 b; Wied-Neuwied, 1820–21, 2:320–321.

MALALÍ

In view of the great disagreement regarding the affinities of the extinct *Malalí* it should be regarded for the present as an independent member of the *Macro-Ge* group as do Métraux and Nimuendajú herein (Handbook, vol. 1, p. 542). Nimuendajú (map and index) puts it among the isolated languages. W. Schmidt (1926) makes it the sole member of the coastal division of his South Group of *Ge*, an opinion with which Loukotka records his disagreement. Loukotka (1931–32 a, 1935, 1939 a) and Rivet (1924 a) place it with *Mashacalí*, though the former does so with a little hesitation, as a language mixed with *Coroado*.

A hasty comparison of the available *Malalí* data suggests that its closest lexical resemblances are with *Patashó* and *Macuní* (*Mashacalí*). Its resemblances to *Purí-Coroado*, *Camacán* (mainly to *Manyá* or *Menien*), *Ge* Proper, and *Caingang* are much less, and those to *Botocudo* *Opayé*, and *Iaté* are very slight. The available lexical material is a little over 100 words; no textual material or grammatical sketch are known. Loukotka (1931–32 a) gives a critique of the value of the three extant vocabularies.

Bibliography.—Loukotka, 1931–32 a; Martius, 1867, 2:207–208; Saint-Hilaire, 1830–51, 1:428–429; Wied-Neuwied, 1820–21, 2:321–323.

COROPÓ

The classification of the extinct *Coropó* language is uncertain and in disagreement; it is, therefore, treated separately and considered an independent member of *Macro-Ge.* Loukotka (1937) calls it the most interesting of all the languages in the old *Ge* group; he believes that it contains a large number of words borrowed from unidentified non-*Ge* languages. Unfortunately, it is extinct without any known textual material.

A comparison by the present author of the two known small vocabularies appears to indicate a fair number of stems showing relationship to the languages of the *Mashacalí* group, especially to *Maconí,* a little less to *Caposhó, Cumanashó,* and *Monoshó,* about the same to *Malalí* and *Patashó* (q. v.), a little less to the *Purí-Coroado* languages. Considerable resemblance was also seen to *Ge* Proper, *Caingang,* and *Botocudo,* but little to *Camacán, Opayé,* and *Iaté.*

The authorities disagree greatly as to whether *Coropó* should be classified with the *Purí-Coroado* group (Nimuendajú, map; Loukotka, 1935, 1937, 1939 a; W. Schmidt, 1926) or with the *Mashacalí* (Rivet, 1924 a). In view of this disagreement, Métraux's statement (Handbook, vol. 1, p. 523) that *Coropó* is "closely" related linguistically (as well as culturally) with *Coroado* and *Purí* can hardly be accepted.

Bibliography.—Eschwege, 1818, pp. 165–171; Loukotka, 1937; Martius, 1867, 2: 167–169.

BOTOCUDO

The name "*Botocudo*" signifies wearers of large lip-plugs and as such has been applied to several groups of different linguistic affinities which must be carefully distinguished. One *Botocudo* group, the *Ivaparé, Are, Sheta,* or *Notobotocudo,* is *Tupí.* The best-known *Botocudo,* however, are *Macro-Ge* peoples. Here two groups must be differentiated. One, of the State of Santa Catarina, is the *Caingang* (q. v.). The larger and better-known group, of Minas Gerais and Espírito Santo, has a language formerly considered *Ge.* It is, however, quite different from *Ge* Proper, and has been accorded independent status by Loukotka (1935, 1939 a) and Nimuendajú (map) and accepted by Métraux (Handbook vol. 1, p. 532). It is here considered as a member of the *Macro-Ge* phylum.

It might be better to allow *Botocudo* independence. No study of it has been presented, and the morphology is unknown. The vocabulary shows a small number of words related to other *Macro-Ge* languages (but relatively few), and some probably due to borrowing. The greater number of resemblances are with *Coroado,* next with *Camacán.* The *Macro-Ge* affinities in the data available are greater than those of *Opayé*, *Iaté*, and *Patashó*, but this may be due to greater amount of data.

The constitution of the *Botocudo* group, since the latter is not well known, is uncertain. The divisions are probably mainly political or geographic. At least four of the languages marked as *Botocudo* by Nimuendajú (map), *Anket*, *Nacnyanuk*, *Pimenteira*, and *Yiporok*, are considered independent by various authors herein. *Pimenteira* (q. v.) is rather distant from the main *Botocudo* group, and is considered *Cariban* by some authorities.

BOTOCUDO (AIMBORE, BORUN)

Araná (*Aranya*)
Crecmun
Chonvugn (*Crenak*)
Gueren
Gutucrac: Minya-yirugn (*Minhagirun*)
Nachehe (*Nakrehe*)
(*Yiporok* [*Giporok*]: *Poicá* [*Poyishá, Požitxá*])
(*Anket ?*)
(*Nacnyanuk ?*)

Bibliography.—Adelung and Vater, 1806–17 (*Engerekmung*); Almeida, 1846; Anonymous, 1852 (*Pozitxa*); Castelnau, 1850–59, pp. 249–259; Ehrenreich, 1887, 1896; Etienne, 1909 (*Borun*); Froes de Abreu, 1929 (*Crenaque*); Ignace, 1909; Jomard, 1846, 1847; Marlière, 1825 a, 1825 b (*Pajaurum, Krakmun, Naknanuk*); Martius, 1867, 2: 177–194 (*Encreckmung, Crecmun, Djiopouroca*); Reye, 1884; Renault, 1904; Rudolph, 1909; Saint-Hilaire, 1830–51, 1: 194–199; Silveira, A. A., 1921, pp. 529–543 (*Pozitxa*); Simões da Silva, 1924 (*Crenak*); Trança, 1882; Tschudi, 1866–69, 2: 288; Wied-Neuwied, 1820–21, 2: 305–314. (Undifferentiated items are all of the *Crecmun* group.)

SHAVANTÉ (CHAVANTÉ, ŠAVANTÉ)

Four groups of Southern Brazil of very different linguistic affinities are known to the Brazilian natives by the name *Chavanté*. They must be carefully distinguished. Three of them, the *Otí*, *Opayé*, and *Cucurá* (q. v.), form small independent (provisionally) families; the fourth, the *Akwẽ* (q. v.), is a *Ge* language.

Bibliography.—Chamberlain, 1910 a, 1913 c; Ihering, 1907; Martius, 1867, 2:135–139.

OTÍ

The extinct *Otí* (*Chavanté*, *Shavanté*, *Eochavanté*) are one of the four groups, all of different linguistic affinities, known as *Chavanté;* they must be distinguished. Now extinct, the small group was named *Eochavanté* by Von Ihering. The language has been accepted as constituting an independent family by all authorities; Rivet (1924 a) terms the family *Savanté*. No suggestions as to larger affiliations have been made by anyone.

Bibliography.—Borba, 1908, pp. 73–76; Ihering, 1912; Vocabulario Comparado . . ., 1892.

OPAYÉ

Until recently accepted as one of the *Ge* languages, *Opayé* or *Opayé Shavanté* was separated from it and considered an independent family by Loukotka (1935, 1939 a). Nimuendajú (map) also calls it isolated. Though probably not extinct the data on it are scant. No grammatical sketch and no linguistic study are known. The lexical material is limited to vocabularies collected by Nimuendajú and published first by Von Ihering (1912) and later, enlarged, by Nimuendajú (1932 a). Each consists of less than 300 words. There are very few resemblances, even distant, with *Ge*, *Camacán*, *Mashacalí* or *Coroado*, and almost all words are very different. The *Ge* and *Camacán* "intrusions" noted by Loukotka (1935, 1939 a) are not evident, and *Opayé* should be considered unclassified until future careful studies may prove otherwise.

In his vocabulary, Nimuendajú gives a few words from a variant dialect *Vaccaria*, which Loukotka terms *Guachi* (*Guači*) of *Vaccaria*.

Bibliography.—Ihering, 1912; Nimuendajú, 1932 a.

CUCURÁ

The sole evidence for this "family," and apparently for the existence of the tribe, seems to be a vocabulary of 31 words gathered by the Czech explorer Frič in 1901 and published by Loukotka (1931 b). These natives of the Rio Verde of Mato Grosso are one of a number of groups known to the Brazilians as *Shavanté* (q. v.). The *Shavanté-Cucurá* are apparently mentioned by no other writer and do not appear in Nimuendajú's map and index. The vocabulary seems to have no resemblance to any of the surrounding languages with which Loukotka compares it, *Opayé*, *Otí*, *Akwẽ*, and *Tupí-Guaraní*, but might show affinity with some more distant stock. A very few words are apparently borrowed from *Tupí-Guaraní*. At any rate such a small vocabulary, taken through an interpreter, can hardly be accepted as definitely establishing a new linguistic family. The language is now presumed to be extinct.

Bibliography.—Loukotka, 1931 b; Nimuendajú, 1932 b.

GUAITACÂN

Goyatacá (*Guaitaká*, *Waitacá*, etc.) was adopted as the name of a stock or family by Chamberlain (1913 a), and as a substock of "*Tapuya*" (*Ge*) by Brinton (1891 a); the latter included under it the *Mashacalí* languages, *Patashó* and *Coropó*. W. Schmidt (1926) accepted it for the name of his subgroup that included the *Purí-Coroado* languages, and Rivet (1924 a) included it in that group.

As *Guaitacá* became extinct before a word of it was recorded (see

Handbook, vol. 1, p. 521; Métraux, 1929 b), it cannot be regarded as anything but an unclassified language, as Nimuendajú places it. There is no reason for classing it with *Purí-Coroado* or with any other group. It very likely, however, was a *Macro-Ge* language. Four subdivisions are known.

GUAITACÁ

1. *Mopi*
2. *Yacorito*
3. *Wasu*
4. *Miri*

Bibliography.—Ehrenreich, 1905; Koenigswald, 1908 b; Métraux, 1929 b; Steinen, 1886.

SMALL LANGUAGES OF THE PERNAMBUCO REGION

(*Fulnió, Natú, Pancarārú, Shocó, Shucurú, Tushá, Carapató, Payacú, Teremembé, Tarairiu or Ochucayana*)

Along and to the northeast of the San Francisco River in the States of Alagoas, Sergipe, Pernambuco, and Bahia are, or were, a number of small tribes the languages of which seem to be sufficiently variant from themselves and from others with which they have been compared to be classified by Nimuendajú (map) and accepted by Lowie (Handbook, vol. 1, p. 553) as isolated or independent. All are so small, unimportant, or newly identified that none of them is mentioned by Rivet (1924 a) or by earlier compilers, and only *Fulnió* (*Iaté*) is listed by Loukotka (1935, 1939 a), and rates especial mention. On all but the last the lexical data seem to be very slight and difficult of access; most of them seem to be in unpublished notes and observations of Estevão de Oliveira and Nimuendajú, whose opinion as to the isolated status must therefore be accepted for the present.

Fulnió.—*Fulnió* (*Fornió, Carnijó, Iaté*) is the native name; the Brazilians of Aguas Bellas call them *Carnijó*. Loukotka (1935, 1939 a) terms the family *Iaté*. There are no subdivisions. Loukotka sees *Camacán* intrusions, and this is borne out by a superficial comparison of the data published by him; *Fulnió* seems to show closer resemblance to *Camacán* than to any other of the *Macro-Ge* languages, but not enough to be itself placed in this group for the present. Schuller (1930 a) improperly identified the language with *Mongoyó*.

Pancararú.—*Pancararú* (*Pankarú, Pancarú*) has sometimes been classified as a *Carirí* language but is better considered as isolated in agreement with the opinions of Lowie and Nimuendajú. (See Handbook, vol. 1, p. 561.)

Shocó.—*Shocó* (*Šokó, Chocó*) must not be confused with the Isthmian *Chocó*.

Shucurú.—*Shucurú* (*Šukurú*) is divided by Nimuendajú (map) into two groups, those of Cimbres and those of Palmeira dos Indios. The latter appear to be known only by the notes of Oliveira.

Teremembé.—Though more important historically than most of the above groups, nothing is known of the language of the *Teremembé* (Métraux, Handbook, vol. 1, p. 573).

Tarairiu or Ochucayana.—Though generally classified as a *Ge* language, the available linguistic data do not support the affinity, and Lowie (Handbook, vol. 1, p. 563) thinks that it may be considered a distinct stock as proposed by Pompeu Sobrinho (1939)—probably too radical a decision, Nimuendajú's preference (map) to leave it unclassified is better. Schuller (1930 a) also called it "ein stamm"; Ehrenreich (1894) believed it affiliated with *Ge* and especially with Patashó. Loukotka (1935, 1939 a) calls it *Carib*, mixed with *Ge*, which is doubtful, in view of its distance from any other *Carib* group.

Natú, Tushá, Carapató, Payacú.—Little is known of these languages. Nimuendajú leaves them unclassified; other authorities ignore them.

Lowie (Handbook, vol. 1, p. 553) speaks of "six unrelated linguistic families within the area": *Fulnió*, *Shucurú*, *Pancararú*, *Natú*, *Shocó*, and *Tushá*. Thus to accord them familial status is certainly not justified by the few data on them.

Bibliography.—See bibliographies in Handbook, vol. 1, pp. 556, 561, 566, 571, 574. Most of the more recent works (Branner, 1887; Melo, 1927, 1929; Pompeu Sobrinho, 1935, 1939; Schuller, 1930 a) refer to the *Fulnió*. Pinto, 1938, treats of the *Pancarú;* Schuller, 1913 c, of the *Tarairiu.*

SOUTHERNMOST LANGUAGES

ATAGUITAN

Ataguita is here for the first time proposed as a hybrid term for the hypothetical *Atacama-Diaguita* linguistic group. It is unproved, and no definite proof of the relationship has been offered, but the connection has been accepted by several authorities. First suggested by Schuller (1908), W. Schmidt (1926) proposed a *Cunza-Diaguita* Group, and Jijón y Caamaño (1941–43) adopts it as an *Atacameño-Diaguita* phylum.

ATACAMA

Synonyms: *Atacameño*, *Cunza*, *Kunza*, *Likananta*, *Likanantai*, *Lipe*, *Ulipe.*

Though a few individuals may still speak the old *Cunza* language little is known of it. A modern study and grammar is urgently needed, though even a thorough study of the grammar of San Román (1890) might link it to one of the larger linguistic families. Most authorities from Chamberlain (1911 b) down have accorded *Atacama* an independent position. Loukotka (1935) sees vestiges of *Arawak* in it. Von Tschudi (1866–69) suggested that it is a descendant of

Calchaqui-Diaguita, and W. Schmidt (1926), accepting the arguments of Schuller (1908), proposes a *Cunza-Diaguita* group, uniting *Atacama* and *Calchaqui.* (See Handbook, vol. 2, pp. 599, 605, 606.)

Bibliography.—Boman, 1908; Brand, 1941 c; Chamberlain, 1911 b, pp. 465–467; Darapsky, 1889; Echeverría y Reyes, 1890, 1912; Maglio, 1890; Moore, 1878; San Román, 1890; Schuller, 1908; Tschudi, 1866–69; Vaisse, Hoyos, and Echeverría y Reyes, 1895.

OMAWACA (OMAHUACA)

The affinities of the extinct *Omahuaca* (*Omawaka, Omaguaca,* etc.) and *Humahuaca* are, and probably always will be, uncertain. It is one of the four South American languages that Loukotka (1935) declined to classify. Rivet (1924 a) places it with *Quechua,* Jijón y Caamaño (1941–43) with *Atacameño-Diaguita.*

The *Omahuaca* are said to have been a mixture of *Diaguita* and *Aymara,* and spoke *Quechua* at the time of their extinction as a tribal entity. (See Handbook, vol. 2, p. 619.)

DIAGUITA OR CALCHAQUÍ

Since not one word of the extinct *Diaguita* or of its related languages has been positively identified, its status depending on early statements and proper-name etymologies, its independent position, relationship with other "families" and with its probably component languages will probably never be conclusively determined, unless a copy of the lost Barcena grammar is found. *Diaguita* (*Diaguite, Diagit*) is the term most frequently used for the group, but *Calchaquí*(*an*) was the earlier term employed by Chamberlain (1912 a, 1912 b) and his followers, and Brinton (1891 a) preferred *Catamareña.*

The language of the *Calchaquí-Diaguita* was known as *Cacan*(*a*) or *Kakan*(*a*). It was replaced by *Quechua* in the 17th century. The *Calchaquí* were but one tribe or nation of the group; other affiliated languages as given in the table were probably of the status of dialects.

The *Lule* enter to complicate the problem even more. This name was probably applied to several different groups in this general region—or else to a group speaking several different languages. The *Lule* of Padre Barcena seem to have been *Diaguita,* to be distinguished from the *Lule* of Machoni, which is *Vilela.* (See *Lule-Vilela, Vilela-Chulupi,* etc.)

The relationship of the extinct *Sanavirón* and *Comechingón* is also in dispute. Most authorities consider these as forming the independent *Sanaviron*(*an*) family. Krickeberg (1922) and W. Schmidt (1926) place them under *Diaguita.* Loukotka (1935) puts *Kakana* (*Calchaquí*), *Sanavirona,* and *Vilela* together in his *Vilela* family. (See Handbook, vol. 2, pp. 657, 661–663.)

Brinton finally accepted the suggestion that *Diaguita* had affinities with *Quechua*. Relationships with the *Atacama* or *Atacameño* family (q. v.) were suggested by Schuller (1908) and accepted by W. Schmidt (1926), who lists a *Cunza-Diaguita* Group, *Kunza* being the name of the principal *Atacama* language. The *Diaguita* "dialects" he lists as *Kaka(na)*, *Tonokote* (placed by others in *Lule*, *Vilela* and *Mataco*), *Zanavirona* (though he also makes a *Sanavirón* family), and *Indamu* (generally placed with *Sanavirón*).

All of the above conflicting opinions seem to be based on the most inferential evidence, from which every seeker after knowledge may take his choice.

Diaguita subgroups:—*Abaucan*, *Amaycha*, *Anchapa*, *Andalgalá*, *Anguinahao*, *Calchaquí*, *Casminchango*, *Coipe*, *Colalao*, *Famatina*, *Hualfina*, *Paquilin*, *Quilme*, *Tafí*, *Tocpo*, *Tucumán*, *Upingascha*, and *Yocabil*. Possibly also: *Acalian*, *Catamarca*, and *Tamano*.

Bibliography.—Barcena, MS., Boman, 1908; Cabrera, P., 1927, 1931; Canals Frau, 1943 a, 1943 b; Chamberlain, 1912 a, 1912 b; Kersten, 1905; Lafone-Quevedo, 1898, 1919 a, 1927; Lizondo Borda, 1938; Schuller, 1908, 1919–20 b, pp. 572–573; Serrano, 1936 b.

CHARRUA, KERANDÍ, CHANÁ, ETC.

Synonyms: *Tšarrua*, *Čarrua*, *Chaná*, *Güenoa*.

Charrua has been accepted as an independent family from the time of Hervás y Panduro (1800), but suggestions as to affiliation with all neighboring groups—*Arawak*, *Ge*, *Guaicurú*, *Guaraní*, and *Puelche*—have been made, as well as its connection with *Querandí*, for which latter various connections have also been proposed (vide infra). Brinton (1898), D'Orbigny (1839), M. S. Bertoni (1916), Outes (1913 b), Serrano (1936 a, 1936 c), Schuller (1906), and others have entered into this argument, as well as the recent classifiers such as Rivet (1924 a), W. Schmidt (1926), and Loukotka (1935). One of the most recent writers, S. Perea y Alonso (1942), considers all the *Chané-Chaná* languages, including *Charrua*, as *Arawak*. Even the present authors herein, Lothrop, Serrano, Cooper, and Métraux, do not agree. Serrano (Handbook, vol. 1, p. 192) considers it related to *Caingang*. Nor is there any agreement as to name; most authorities use variants of *Charrua*, but Serrano herein insists that the generic name should be *Güenoa*.

Most of the arguments are based on historical evidence and inference, since all of the languages have long been extinct with little recorded data; no more than 7 words of *Charrua* were known. Recently, however, some 70 more words have been found and published (Gómez Hardo, 1937), but never scientifically compared with other languages.

The opinions of present contributors may be cited as the most modern. Serrano is certain that *Charrua* is a dialect of *Chaná* and related to the *Caingang* of Rio Grande do Sul (cf. *Macro-Ge*). Métraux doubts the *Ge* affiliation, and suggests that a comparison with *Puelche* and other Patagonian and Chaco languages might prove fruitful; Lothrop wisely makes no suggestions as to wider affiliations. Nimuendajú's decision to leave *Charrua* unclassified is doubtless the wisest one. *Charrua* subtribes are said to be *Guayantiran*, *Palomar*, and *Negueguian*.

In the La Plata region were many other languages, now long extinct, on which the data are very deficient, with consequent great differences of opinion regarding their affiliations. All these had best be left unclassified. Most of them have been traditionally considered *Charruan*. Prominent among these is the *Querandí* (*Kerandí*), which has variously been considered of *Guaicurú*, *Het* (*Tehuelche*), *Araucanian*, and *Guaraní* affiliations. Cooper (Handbook, vol. 1, p. 137) says there is good argument for considering it *Puelche*. *Güenoa* and *Bohané* may relate closely to *Charrua*, possibly also *Caracaná*. Other of the more important groups are *Minuané*, *Yaró*, *Colastiné*, *Corondó*, *Timbú*, *Mbeguá*, and *Carcarañá*. Of lesser importance are *Kiloazá*, *Cayastá* (*Chaguayá*), and *Macurendá* (*Mocoretá*). (See Lothrop, Handbook, vol. 1, pp. 177–190.)

Bibliography.—Brinton, 1898 a; Chamberlain, 1911 b, pp. 469–471; Gómez Hardo, 1937; Kersten, 1905; Lothrop, 1932; Martínez, B. T., 1919; Orbigny, 1839; Outes, 1913 b; Perea y Alonso, 1938 b, 1942; Rivet, 1930 a; Schuller, 1906, 1917; Serrano, 1936 a, 1936 c; Vignati, 1931 d.

CHANÁ

Synonyms: *Tšaná*, *Tschaná*, *Čaná*.

One of the important groups in this area, undifferentiated in locale, is the *Chaná*. Nimuendajú accepts the *Chaná* as a linguistic entity, leaving all the other before-mentioned languages as unclassified. Affiliated with the *Chaná* seem to be the *Chaná-Mbeguá*, *Chaná-Timbú*, and the *Yaró*. Perea y Alonso (1942) relates these *Chaná* to the *Chané* (q. v.) of southern Brazil and apparently believes almost all the above-mentioned groups, including *Charrua* and all the natives of the Banda Oriental of Uruguay, to be *Arawak*. For geographic reasons this is open to doubt, pending further exposition.

Chaná is a descriptive term and as such applied to a number of distinct groups of different linguistic affiliations that are liable to be confused. It is said to be a *Tupí* word, probably meaning "my relations." It seems to have been applied to certain *Tupí*, *Guaraní*, and *Chiriguano* groups. It also seems to be a synonym for the *Layaná*, a southern *Arawak* group (according to W. Schmidt, 1926; Nimuendajú considers the *Layana* to be *Guaicurú*., q. v.).

Larrañaga (1924 b) says the language was guttural, an amateurish characterization applied to many Indian languages. Larrañaga's vocabulary and grammar was published by Lafone-Quevedo and Torres. (See also *Chané.*)

Bibliography.—Brinton, 1898 a; Cardus, 1886; Kersten, 1905; Lafone-Quevedo, 1897 a, 1922; Larrañaga, 1924 b; Lothrop, 1932; Orbigny, 1839; Outes, 1913 b; Serrano, 1936 a, 1936 c.

ALLENTIAC OR HUARPEAN

Huarpe might be a better term than *Allentiac* for this linguistic group, and is preferred by some modern writers, but the latter name is probably too well established to make a change advisable. It has been accepted as an independent family or stock by all authorities since Brinton (1891 a) and Chamberlain (1913 a), generally under the name *Allentiac* or variations thereof. *Huarpe* (*Guarpe*) is a synonym of *Allentiac.* There is general agreement that the *Millcayac* language was rather closely related.

The languages became extinct in the 18th century. However, grammars of both *Allentiac* and *Millcayac* by Padre Valdivia are known, though the first editions are extremely rare. Though the group will probably eventually be tied up with some of the neighboring languages, and probably affiliated with some one of the larger phyla, few suggestions as regards such relationships have been made, and none accompanied by good evidence. Some early statements suggest a relationship with *Puelche,* and Brinton (1891 a) placed *Huarpe, Puelche,* and *Araucanian* in his *Aucanian* linguistic stock.

Canals Frau (1944) presents extensive evidence and argument that the *Comechingön* (q. v.) were related to the *Huarpe,* and terms the linguistic group *Huarpe-Comechingón.* He considers the group to consist of the following languages:

(1) *Allentiac* or *Huarpe* of San Juan; (2) *Millcayac* or *Huarpe* of Mendocino; (3) *Puntano Huarpe;* (4) *Puelche* of Cuyo; (5) Ancient *Pehuenche;* (6) Southern *Comechingón,* language: *Camiare;* (7) Northern *Comechingón,* language: *Henia;* (8) possibly *Olongasta* (Indians of Southern Rioja). (See Canals Frau, Handbook, vol. 1, p. 169.)

As subgroups or dialects Pericot y García (1936) names *Zoquillam, Tunuyam, Chiquillan, Morcoyam, Diamantino* (*Oyco*), *Mentuayn, Chom, Titiyam, Otoyam, Ultuyam,* and *Cucyam.*

Bibliography.—Cabrera, P., 1928–29; Canals Frau, 1941, 1942, 1943 a, 1943 b, 1944; Chamberlain, 1912 b; La Grasserie, 1900; Márquez Miranda, 1943, 1944; Medina, J. T., 1918; Mitre, 1894; Schuller, 1913 a, 1913 d.; Valdivia, 1607 a, 1607 b.

SANAVIRÓN AND COMECHINGÓNAN

SANAVIRÓN

There are few linguistic data on which to classify the extinct *Sanavirón* and its affiliated languages, and the opinions are, therefore, very variant. Most authorities, such as Chamberlain (1913 a), Rivet (1924 a), and Nimuendajú (map and index), class it as an independent family. Krickeberg (1922) places it under *Diaguita;* W. Schmidt (1926) equivocates by establishing a *Sanavirón* family, but also placing *Zanavirona* in his *Cunza-Diaguita* group. Loukotka (1935) groups *Sanavirona*, *Kakana* (*Calchaquí-Diaguita*), and *Vilela* in his *Vilela* family. Jijón y Caamaño (1941–43) also places *Sanavirón* in his *Vilela-Lule* phylum.

Sanavirón is omitted from the accompanying linguistic map, the occupied area being allotted to *Comechingón.*

Bibliography.—Chamberlain, 1910 a, p. 198.

COMECHINGÓN

So little is known of the extinct *Comechingón* that its affiliation may never be determined, and there is no present consensus. It has been connected with three families, also all extinct. Most authorities place it with *Sanavirón;* Krickeberg (1922) considers it related to *Diaguita.* The most recent writer, Canals Frau, (Handbook, vol. 1, p. 169; also 1944) links it with *Huarpe* (*Allentiac*). It is one of the few languages that Loukotka (1935) wisely refuses to attempt to classify. There seem to have been five subgroups or dialects. *Michilingüe* apparently belonged to the same group. *Indamá* or *Indamu* is generally associated with *Comechingón,* but W. Schmidt (1926) puts it with *Zanavirona* in the *Cunza-Diaguita* group, not with *Comechingón* under *Sanavirón.*

I. *Comechingón*
    A. *Comechingón*
        1. *Main*
        2. *Tuya*
        3. *Mundema*
        4. *Ca̍ma*
        5. *Umba*
    B. *Michilingwe*
    C. *Indama*

Bibliography.—Canals Frau, 1944.

ARAUCANIAN

The *Araucanian* (*Araukan*, *Aucanian*, *Aucan*) languages occupied a moderately large solid area in northern Chile and adjacent Argentina; their modern range is considerably reduced though the language is still vigorous, with speakers said to number upward of fifty thousand. Their relationship with *Puelche*, *Het*, and *Tehuelche* or *Chon* (q. v.), as well as with other "families" to the north of these, is likely but unproved. Considerable confusion is caused by the fact that names of certain groups in almost all of these families end in "che," and others ending in "het" are also thus divided. No one seems to have attempted to subdivide the family on a linguistic basis, or to have presented concise data on which this could be done. The linguistic divisions probably coincide with the political and geographical ones, but many groups, especially the extinct ones, are of doubtful relationship, even as to the *Araucanian* family. The classification here given is based primarily on Brand (1941 c), so far as that goes. Few of the other authorities agree with him or among themselves as regards the minor groupings. The living groups are said to be of the order of dialects, all mutually intelligible. The linguistic affinities of the *Pewenche* (*Pehuenche-Puelche*) and the *Huilliche Serrano* are questionable. (See Cooper, Handbook, vol. 1, pp. 128, 132, vol. 2, pp. 688–696; Canals Frau, Handbook, vol. 2, pp. 761–766.)

The *Araucanian* languages are said to be pleasant and harmonious.

ARAUCANIAN

I. North
    A. *Picunche*
    B. *Mapuche*
        1. *Pewenche*
            a. *Rankel*(*che*)
        2. *Moluche*
II. South
    A. *Wiliche* (*Huilliche*)
        1. *Wiliche*
            a. *Serrano*
            b. *Pichi-Wiliche*
        2. *Manzanero*
    B. *Veliche* (*Chilote*)
    C. *Chikiyami* (*Cuncho*)
    D. *Leuvuche*
III. East
    A. *Taluhet* (*Taluche*) [1]
    B. *Divihet* (*Diviche*) [1]

[1] Possibly member of separate *Het* family (q. v.).

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Adelung and Vater, 1806–17; Amberga, 1914; Ameghino, C., 1913; Anonymous, 1876; Augusta, 1903, 1916, 1922; Barbara, 1879; Brand, 1941 a, 1941 c; Cañas Pinochet, 1902, 1911 a; Darapsky, 1888; Echeverría y Reyes, 1900; Englert, 1934; Falkner, 1899; Febres, 1765, 1864, 1882; Figueroa, 1903; Groeber, 1926; Gusinde, 1936; Gutiérrez, 1871; Huaiquillaf, 1941; La Grasserie, 1898; Latcham, 1942; Lenz, 1895–97, 1904–05; Lillo, 1928; Loukotka, 1929–30, pp. 75–83; Milanesio, Domingo, 1918; Mitre, 1894, 1909, pp. 311–338; Moesbach, 1929–31, 1936,

Outes, 1914; Rodríguez, Z., 1875; Santa Cruz, 1923 b; Schuller, 1908; Sigifredo, 1942–45; Speck, 1924; Valdivia, 1887, 1897; Zeballos, 1922 b.

CHONO

The *Chonoan* "family" of the Chilean coast, recognized by Chamberlain (1913 a) and his followers, is no longer accepted. Only three words seem to be known, and its independence was presumed on grounds of early statements. Affiliations have been suggested with all the neighboring groups, *Araucanian*, *Tehuelche*, and *Alacaluf*. Rivet (1924 a) placed it with the last. It had best be left unclassified. It must be distinguished from the *Chon* (*Tšon*) or *Tehuelche*, but doubtless these names are of common origin. (See Handbook, vol. 1, pp. 48–49).

Bibliography.—Chamberlain, 1911 a; Cooper, 1917 a, 1917 b; Ferrario, 1939.

PUELCHEAN

Synonyms: *Pueltše, Puelče, Kunnu, Gennaken, Pampa.*

The group has been recognized since early days but its constitution is greatly under discussion. Brinton (1891 a) grouped *Puelche*, *Araucanian*, and some other languages in his *Aucanian* stock; Chamberlain (1911 a, 1913 a) and all subsequent authorities have accepted a *Puelche*(*an*) family. They are often referred to as northern *Tehuelche*, or merely *Tehuelche*, but belong to a separate family from the true or southern *Tehuelche;* the latter is the older name for the southern family but leads to confusion with the *Puelche*, so the modern name *Chon* (q. v.) is preferable for the former.

All authorities recognize but one language in the family, *Puelche*, unless *Chechehet* is related; this is now often placed in a family of its own, *Het* (q. v.). Ten dialects are said to have been spoken, but today only two, eastern and western, are reported. Relationships have been suggested with *Guaicurú*, *Araucanian*, *Het*, *Chon*, and *Charrua*, none of which would be in the least surprising. The old source, Valdivia (1607), says that *Puelche* differs very slightly from *Millcayac* (*Allentiac*), but he may have been referring to another group of *Puelche.*

Bibliography.—Adelung and Vater, 1806–17; Brinton, 1892 d; Chamberlain, 1911 b; Harrington, T., 1925; Milanesio, Domenico, 1898; Outes, 1928 a; Outes and Bruch, 1910; Valdivia, 1607 a.

HET (CHECHEHET)

Although only 15 words and some place names seem to be known, Lehmann-Nitsche argued that the language of the *Chechehet* (*Tšetšehet*, *Čečehet*), formerly considered as a *Puelchean* (q. v.) language, is radically different from the latter and entitled to be considered an independent family. He called the family "*Het*"; Rivet (1924 a) adopts the same name. Loukotka (1935) and Nimuendajú prefer their orthographic variants of *Chechehet;* the former accepts it as a family, the latter as "isolated." Together with the *Chechehet* go a group who lived with the *Araucanian Divihet* (*Diuihet*) and were known by that name only. The pertinent linguistic data are based on Falkner (1774), Hervás y Panduro (1800), and Dobrizhoffer (1784). The language became extinct about the close of the 18th century.

The solution of the *Het* question is an historical, not a linguistic, one. (See also Handbook, vol. 1, p. 134.)

Bibliography.—Dobrizhoffer, 1784; Falkner, 1774; Hervás y Panduro, 1800; Lehmann-Nitsche, 1918 a, 1922, 1925 b, 1930 a.

CHONAN OR TEWELCHE (TEHUELCHE) AND ONA

The *Chon* or *Tehuelche* (*Tšon, Tschon, Čon, Tsonekan, Tehuelchean*) has been considered independent since earliest classifications, and no suggestions of larger relationships have been made except for those of Rivet (1925 a, 1925 b, 1925 c, 1926 a, 1926 b, 1927 b, 1927 c) whose revolutionary belief in a connection with Australian languages has been accorded ex-cathedra condemnation by all North American anthropologists, probably without sufficient scientific consideration.

The term *Tehuelche* was often used in a geographical rather than a linguistic sense, and the northernmost *Tehuelche*, the *Küni*, seem to have spoken a *Puelche* tongue. The three languages of *Tehuelche* proper were almost unintelligible, but now are less so (Cooper, Handbook, vol. 1, p. 130). The two divisions of the *Ona* could understand each other only with difficulty; the dialects differ slightly (Cooper, Handbook, vol. 1, p. 108). However, *Tehuelche* and *Ona* are rather closely related. The various classifications differ but slightly. The affiliations of the *Paya* are uncertain.

Ona was long considered as forming a separate family from *Tehuelche*. Though the names are probably connected in origin, the *Chon* must be differentiated from the *Chono* (q. v.) of the Chilean coast.

CHON

I. *Chon* (*Tehuelche*)
    A. *Tehuelche*
        1. *Tä'uūshn* (*Tewesh*)
        2. Northern: *Payniken* (*Pä'änkūn'k*)
            a. *Poya*
        3. Southern: *Inaken* (*Ao'nūkūn'k*)
    B. *Ona* [1]
        1. *Haush* (*Manekenkn*)
        2. *Shelknam*
            a. Northern
            b. Southern

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[1] Brinton (1891 a, p. 331) gives *Huemul* and *Peschere* (*Ire*) as other divisions of the *Ona*.

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YAHGANAN

The independence of the *Yahgan* (*Yagan*, *Yámana*, *Yahganan*) family or stock has never been doubted. Except from this point of view it is unimportant; it is practically extinct; probably not more than 20 *Yahgan* survive. The tongue is said to be markedly euphonic, soft, melodious, agreeable, with a rich vocabulary.

There is only one language, with five mutually intelligible dialects, of which the Central and Western are said to be most alike.

I. *Yahgan*
    A. Eastern
    B. Central-Western
        1. Central
        2. Western
    C. Southern
    D. Southwestern

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ALACALUFAN

The *Alacaluf* (*Alikuluf*, *Alukulup*, and similar orthographical variants), the southernmost language of South America, has been recognized since earliest times as constituting an independent family. No relationships with any other group have been suggested, except Rivet's (see *Chon*) belief in their connection with Australian languages. The language is said to be harsh, with explosives and gutturals, though not so strong as in *Ona*. Three "dialects" are reported, but 10 or more groups, presumably each with its dialect, are named; how they group in subdivisions is unknown. The northernmost, *Chono* (q. v.), is of uncertain affiliation. Most of the languages or dialects are extinct. The same may almost be said of the group; estimates of their number vary from 250 to none.

The following groups or dialects are reported:

Caucawe (*Kaukahue*, etc.)
Enoo or *Peshera* (*Pešera*)
Lecheyel (*Letšeyel*)
Yekinawe (*Yequinahuere*, etc.)
Adwipliin
Alikulip, *Alakaluf*, etc.
Calen
Taijatof
Chono (*Tšono*) (*q. v.*), *Caraica* (*Karaika*), and *Poya* may also belong.

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PART 4. GEOGRAPHY AND PLANT AND ANIMAL RESOURCES

GEOGRAPHY OF SOUTH AMERICA

By CARL O. SAUER

RELIEF

In major design the two continents of the New World have certain striking resemblances. (For South America, see maps 7 and 8.) Both are triangular, broad at the north, ending in an acute tip at the south. Both have their great mountains at the west, fringing the Pacific Ocean; and hence this ocean receives only a minor part of the continental drainage. Both have wide, ancient highlands at the east, largely reduced by long-continued erosion to hill lands and rolling uplands. In both cases, between eastern uplands and western mountains, lie great plains, now or in the past subject to heavy aggradation from the waste of the elevated lands both to the east and west. A broad resemblance may be pointed out between the continental position of the Mississippi Basin and that of the La Plata, perhaps even between the Great Lakes-St. Lawrence and the Amazon Basins. Thus far, an almost identical schematic diagram could be drawn for the two continents, suggesting basically similar dynamics of crustal modeling.

THE EASTERN HIGHLANDS

From the mouth of the Orinoco River almost to the estuary of the Rio de la Plata an ancient land mass fronts the Atlantic Ocean, interrupted only by the trough of the lower Amazon River. The Amazon is no ordinary river valley but a great, and partly ancient, structural depression, which has long separated the old land mass of Brazil to the southeast from that of Guiana on the north. Together Brazil and Guiana form the core of the South American continent, a stiff fundament of ancient igneous and metamorphic rocks, partially covered by sedimentary beds, mostly of Paleozoic age. The parallel to the North American Laurentian Shield, the Old Appalachians, and the Ohio Basin cover of Paleozoic sedementary rocks is apparent.

The Guiana Highlands.—These form the land surface between the Amazon-Yapura and the Orinoco Rivers. It is to be noted that they occupy all but a narrow coastal stretch of the colonies that bear their name and also include most of Brazil north of the Amazon River, as well as the southern half of Venezuela and a large part of eastern Colombia. In length they are about equal to the North American Appalachian area (Alabama to Gaspé Peninsula); in width they surpass it considerably.

The greater part of this surface is underlain by igneous and metamorphic rocks, presumably ancient granites and gneisses, with infolded bodies of schists and quartzites, said usually to lie in east-west strips. The quartzites commonly stand out as ridge makers. The watershed between the lower Amazon River, on the one hand, and the Essequibo River and streams of the northeast, on the other, constitutes one of the highest and most dissected parts of the ancient rock mass, culminating in the Sierra of Acarai, around 5,000 feet (1,500 m.). Between the Amazon (Río Negro) and Orinoco Rivers the watersheds are in part indistinct. Yet about the Orinoco River, in southern Venezuela, lie numerous detached mountain chains, supposedly of elevations to 6,000 feet (2,000 m.) and more and formed of granitic and gneissic rocks. Mostly the granites and metamorphic rocks constitute a rolling upland cut by many streams into an intricate and in part irregular pattern of hills and valleys. The rocks are deeply weathered and the residual soils, often brick red, are too greatly leached to be fertile.

Beds of sedimentary rock, especially sandstones and conglomerates, once overlay much if not all of the Guiana region, but have been largely stripped off by erosion. There remain three major areas of sedimentary cap: (1) The southern margin has fringing slopes down to the Amazon, of a large variety of beds. (2) In the middle of the highland lies a great block of sandstones and conglomerates, culminating around 8,000 feet (2,600 m.) in the Sierra of Roraima and westward in the Sierra of Pacaraima. These beds form sheer cliffs enclosing tablelands, deeply trenched by streams. (3) In the far west, almost against the foot of the Andes, the mesas of Pardaos and of Iguaje separate the Llanos of the Orinoco River from the alluvial lowlands of the Amazon River. None of these uplands of sedimentary rocks is suitable for agriculture. Throughout the Guiana Highlands, it appears that agricultural advantage is limited to the valley bottoms and that these are not of remarkable fertility.

The Brazilian Highland.—The Brazilian Highland, or upland as it might better be named, is traced in outline as to its interior limits by stream courses, not to be thought of as marking an abrupt change from plateau to lowland. However, the northwestern limit is quite well indicated by the lower Amazon River, west to its junction with the Madeira River, then by following the latter upstream to its junction with the Beni River. Here is the most interior end of the Brazilian uplands. Continuing thence, the boundary swings sharply southeastward, along the eastern side of the lower Mamoré River, and following the entire length of the Guaporé River to the interlacing of its headwaters with those of the Paraguay River. The rest of the land boundary is parallel to, and at varying distances to the east of, the course of the Paraguay-Paraná, south to lat. 30° S. Here the bounding escarpment runs directly eastward as the Serra Geral, across the State of Rio Grande do Sul to the sea in the vicinity of Pôrto Alegre. The Highland fills not only the greater part of the political frame of Brazil, but also includes the Misiones Territory of the Argentine, the southeastern part of Paraguay, and may even be considered as entering the easternmost tip of Bolivia.

This, the greatest geologic block of South America, resembles the Guiana Highlands in materials and surface, with the difference that in the Brazilian Highland, land surfaces derived from sedimentary rocks (sandstones and conglomerates) predominate over those formed by the degradation of granites, gneisses, schists, and metamorphic rocks.

The ancient crystalline and metamorphic fundament of Brazil is widely exposed in three areas: (1) The eastern border of the Highland against the Atlantic; (2) the greater part of the State of Goiás, where the drainage of the upper Tocantins River has uncovered the basement rocks over a large area; and (3) the northwest flank, sloping down to the Amazon and Madeira Valleys. A lesser fourth region might be added, about the headwaters of the Paraguay and Guaporé Rivers, below the scarp and Plateau of Mato Grosso, and situated in the State of Mato Grosso and in eastern Bolivia. Of these areas, all but the Goiás one are marginal to the Highland; all appear to be undistinguished as to relief, and are sometimes referred to as somewhat dissected peneplains. The soils are reddish, and where derived from schistose rock are likely to be tough and compact and of low fertility.

The eastern area of the basement rocks may be divided into three subregions: The "shoulder" of Brazil, comprising the six small States of the northeast, behind Cape São Roque; the interior basin of the São Francisco; and the Serra do Mar from Bahía to Santa Catarina.

The physical characteristics of these three subregions are as follows:

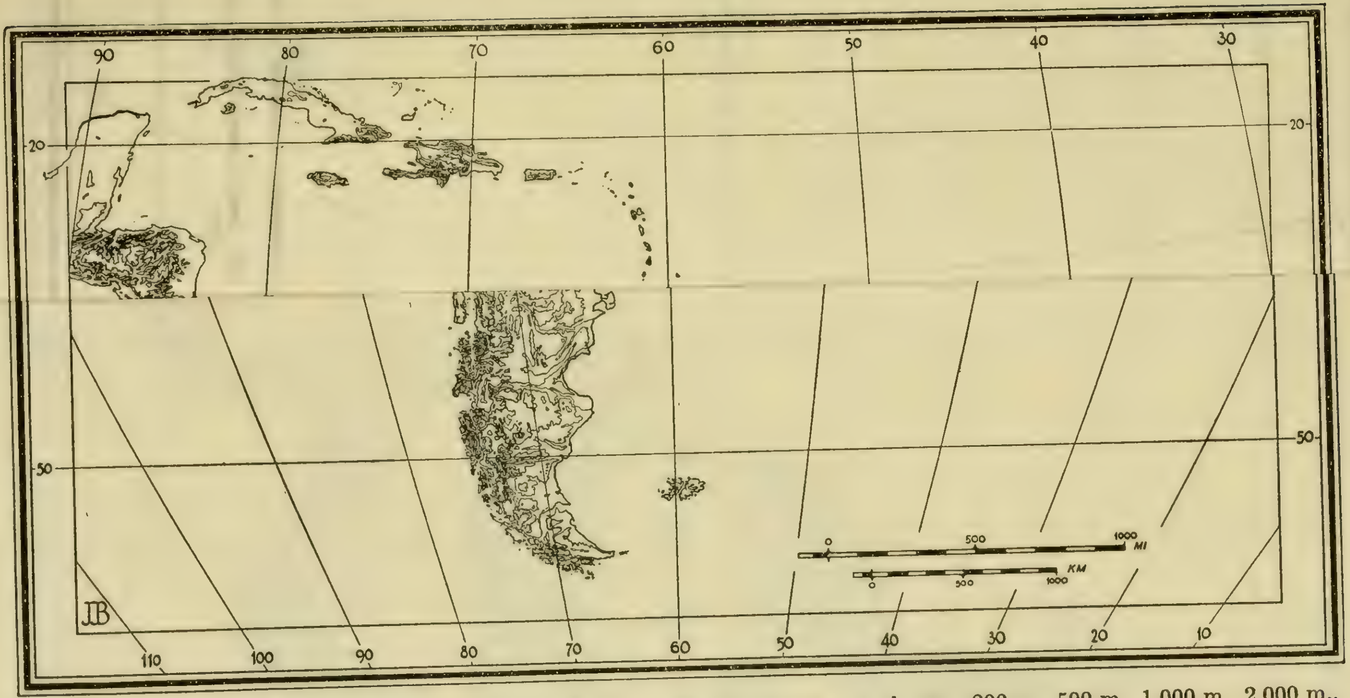
(1) The northeastern part of Brazil is a plateau or peneplain of crystalline rocks attaining, behind Recife, maximum heights of about 3,000 feet (1,000 m.) in the highlands of Borborema. Here and there a sharp ridge of quartzite rises, as in the Serra da Itabaiana, straddling the lower São Francisco River. The descent from highland to coast is in general gradual, and the coast area itself has low slopes developed on various sedimentary rocks.

(2) The basin of the São Francisco, in the western part of the State of Bahía, is considered a peneplain, over which the river wanders at a very low gradient. Only upon reaching the State of Pernambuco, on its swing to the east, does its course accelerate. Here at the western boundary of the State of Alagoas, are the granite canyon and falls of Paulo Affonso. A short distance below, the river is at grade, from Piranhas to the sea.

(3) The Serra do Mar, of granites and gneisses, forms an increasingly impressive background to the coast as one goes south from Bahía. A short distance behind Rio de Janeiro it attains a height of 7,000 feet (2,200 m.), and it continues as an unbroken front range to its termination in Rio Grande do Sul. Excepting the area from Santos to Rio de Janeiro, fan slopes and even coastal terraces form a narrow but important corridor between serra and sea; here mountain streams deposit their alluvium in flood plains and deltas. Behind the Serra do Mar at the city of Rio de Janeiro, the Parahyba River (of the south) drains a structural basin, which is parallel to the coast and runs the entire length of the State of Rio de Janeiro.

Inland from the Serra do Mar, and stretching north from São Paulo into the great bend of the São Francisco River, is a highland of most complicated structure and relief. This is known in the north (Bahía) as the Chapada Diamantina, in the center (Minas Gerais) as the Serra do Espinhaço, and at the south (behind the cities of Rio de Janeiro and São Paulo) as the Serra da Mantiqueira. Ancient folding and faulting has thrown a great series of rocks, ranging from old crystalline and metamorphic members of the Brazilian Shield to Paleozoic sedimentary rocks, into parallel strips, trending on the whole parallel to the coast line. The result of its erosion is a relief somewhat reminiscent of our folded Appalachians, parallel valleys in the weaker rocks, master streams that cut directly across the structural lines in gorges, with cliff-fronted, smooth-topped interfluves on resistant rocks. A bewildering variety of highly metamorphosed sandstones (quartzites and itacolumites) provides the principal resistant, ridge-forming beds of this area.

At the south and southwest, that is, in the States of Santa Catarina, Paraná, and parts of São Paulo, the surface is formed by beds of basalt and red sandstone, of relatively late age, spread out over the older rocks of the plateau. This area is sometimes called the Plateau of Paraná. The volcanic materials in general weather into deep, red, productive soils, which also contribute to the fertility of alluvial soils derived therefrom. Where basalts cap, or are interbedded with shales and weak sandstones, high cliffs develop, as along the edge of the Plateau and along the stream courses (e. g., the valley of the Uruguay River).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Map 7.—Relief map of South America. The following successive contours are shown: 200 m., 500 m., 1,000 m., 2,000 m., 3,000 m., and 4,000 m.

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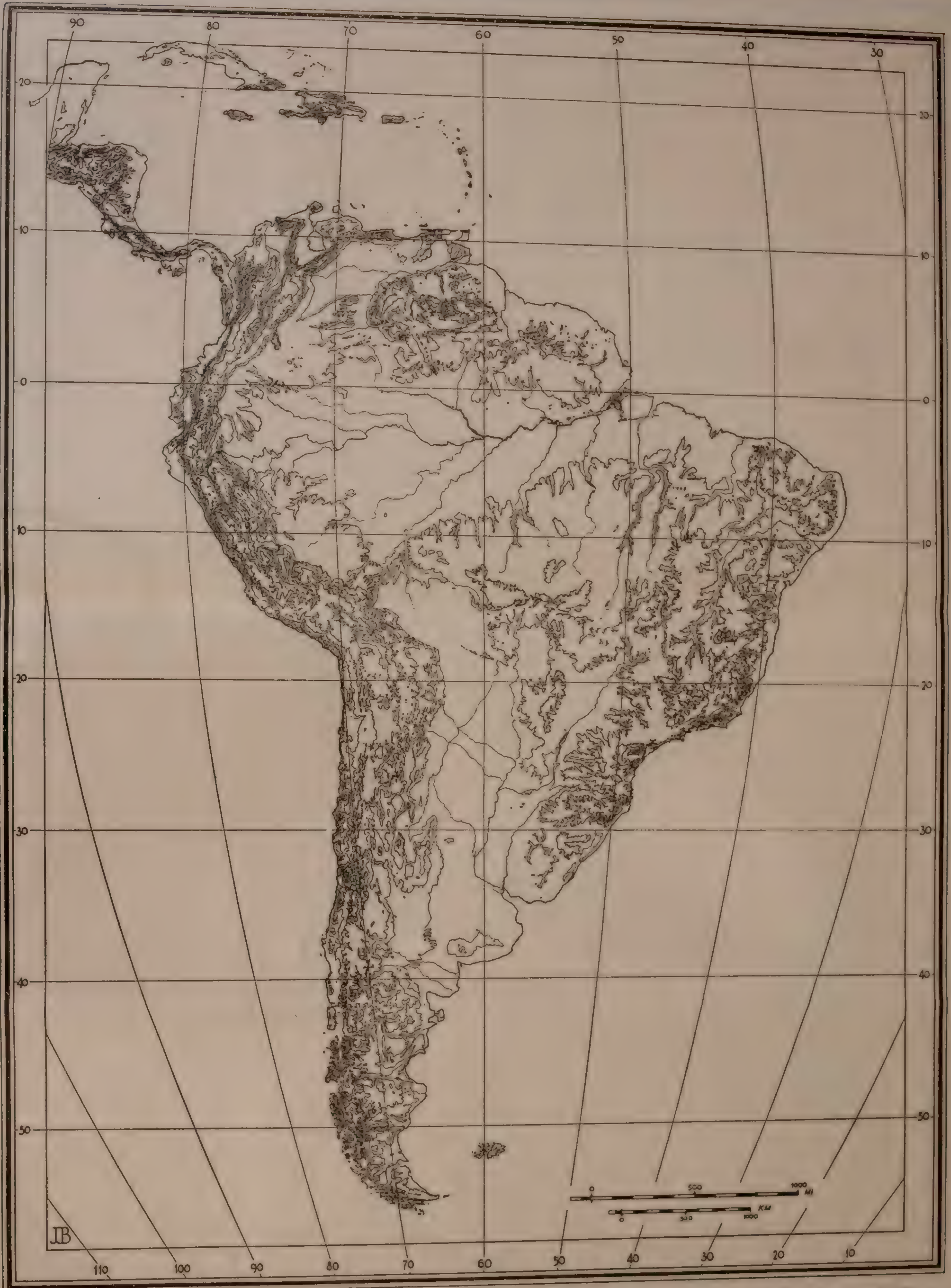
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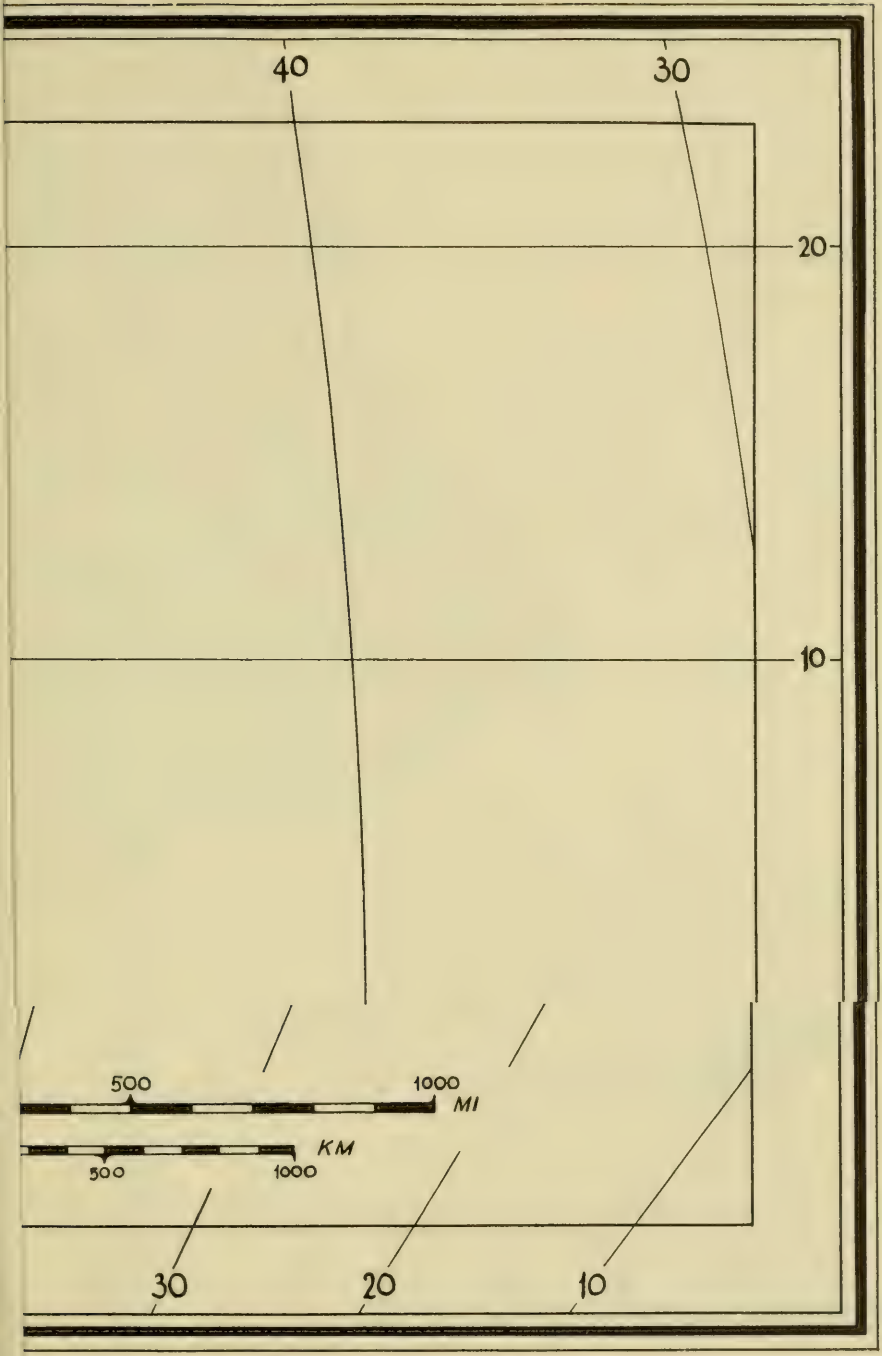
Map 7.—Relief map of South America. The following successive contours are shown: 200 m., 500 m., 1,000 m., 2,000 m., 3,000 m., and 4,000 m.

BULLETIN 143, VOL. 6, MAP 8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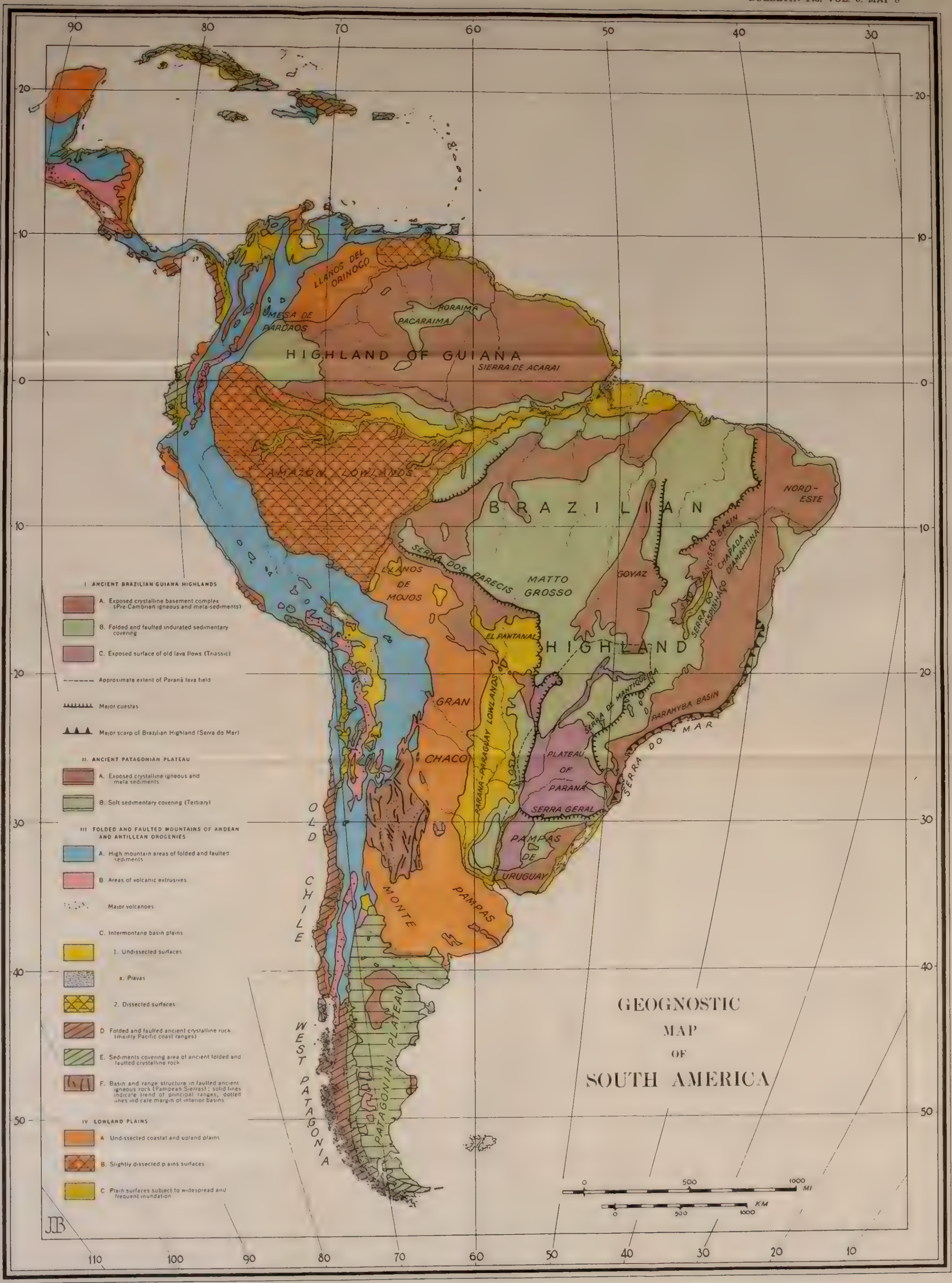
I ANCIENT BRAZILIAN GUIANA HIGHLANDS
A. Exposed crystalline basement complex (Pre-Cambrian igneous and meta-sediments)
B. Folded and faulted indurated sedimentary covering
C. Exposed surface of old lava flows (Triassic)
Approximate extent of Paranã lava field
Major cuestas
Major scarp of Brazilian Highland (Serra do Mar)
II. ANCIENT PATAGONIAN PLATEAU
A. Exposed crystalline igneous and meta sediments
B. Soft sedimentary covering (Tertiary)
III FOLDED AND FAULTED MOUNTAINS OF ANDEAN AND ANTILLEAN OROGENIES
A. High mountain areas of folded and faulted sediments
B Areas of volcanic extrusives
Major volcanoes
C. Intermontane basin plains
1. Undissected surfaces
a. Playas
2. Dissected surfaces
D Folded and faulted ancient crystalline rock (mainly Pacific coast ranges)
E. Sediments covering area of ancient folded and faulted crystalline rock
F. Basin and range structure in faulted ancient igneous rock (Pampean Sierras); solid lines indicate trend of principal ranges, dotted lines indicate margin of interior basins
IV LOWLAND PLAINS
A Undissected coastal and upland plains
B. Slightly dissected plains surfaces
C Plain surfaces subject to widespread and frequent inundation
LLANOS DEL ORINOCO
MESA DE PARDAOS
RORAIMA
PACARAIMA
HIGHLAND OF GUIANA
SIERRA DE ACARAI
AMAZON LOWLANDS
BRAZILIAN HIGHLAND
NORD-ESTE
SERRA DOS PARECIS
MATTO GROSSO
GOYAZ
SÃO FRANCISCO BASIN
CHAPADA DIAMANTINA
SERRA DO ESPINHAÇO
LLANOS DE MOJOS
EL PANTANAL
GRAN CHACO
PARANA-PARAGUAY LOWLANDS
SERRA DE MANTIQUEIRA
PARAHYBA BASIN
SERRA DO MAR
PLATEAU OF PARANÁ
SERRA GERAL
PAMPAS DE URUGUAY
OLD CHILE
MONTE
PAMPAS
WEST PATAGONIA
PATAGONIAN PLATEAU
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GEOGNOSTIC
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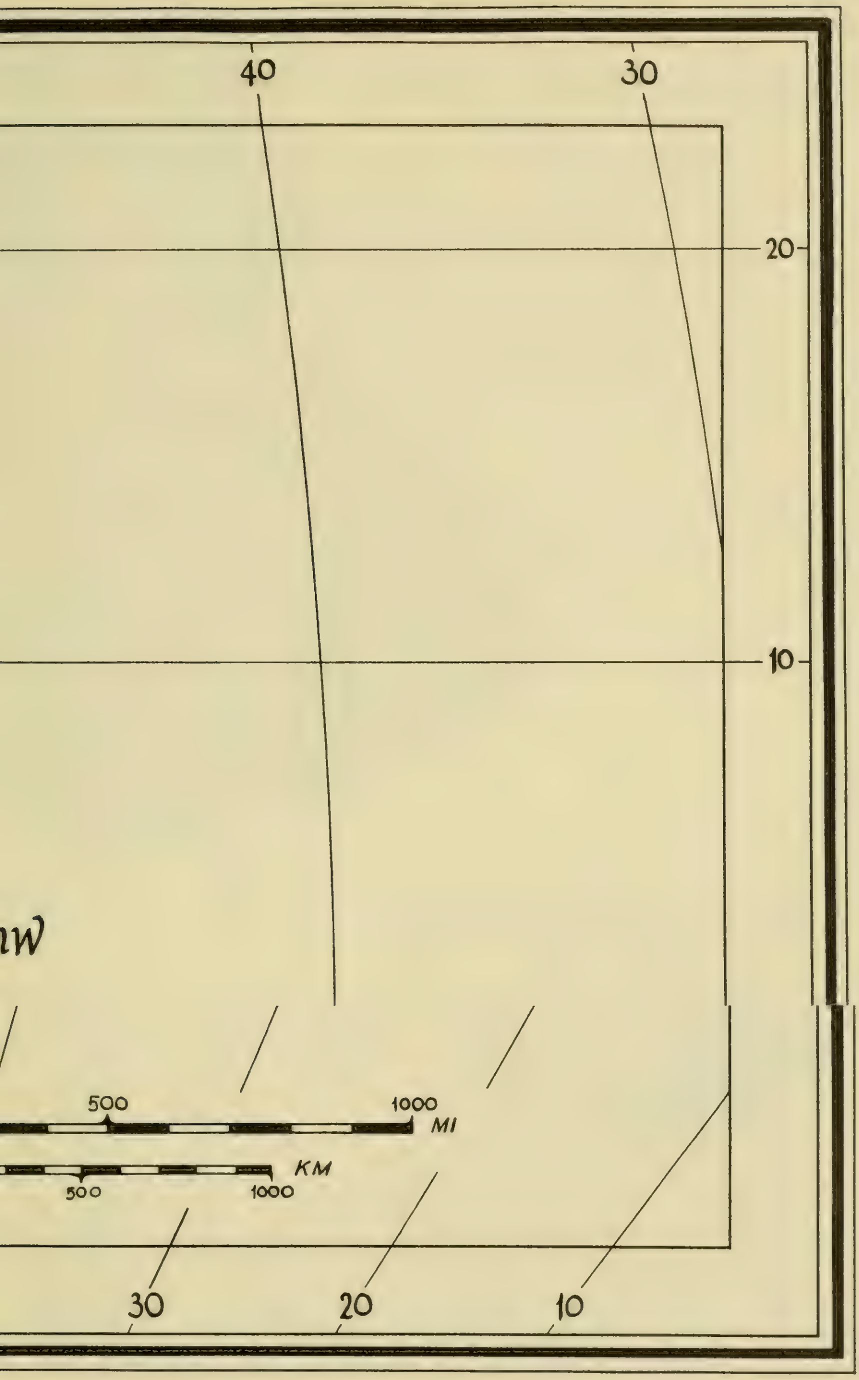
SOUTH AMERICA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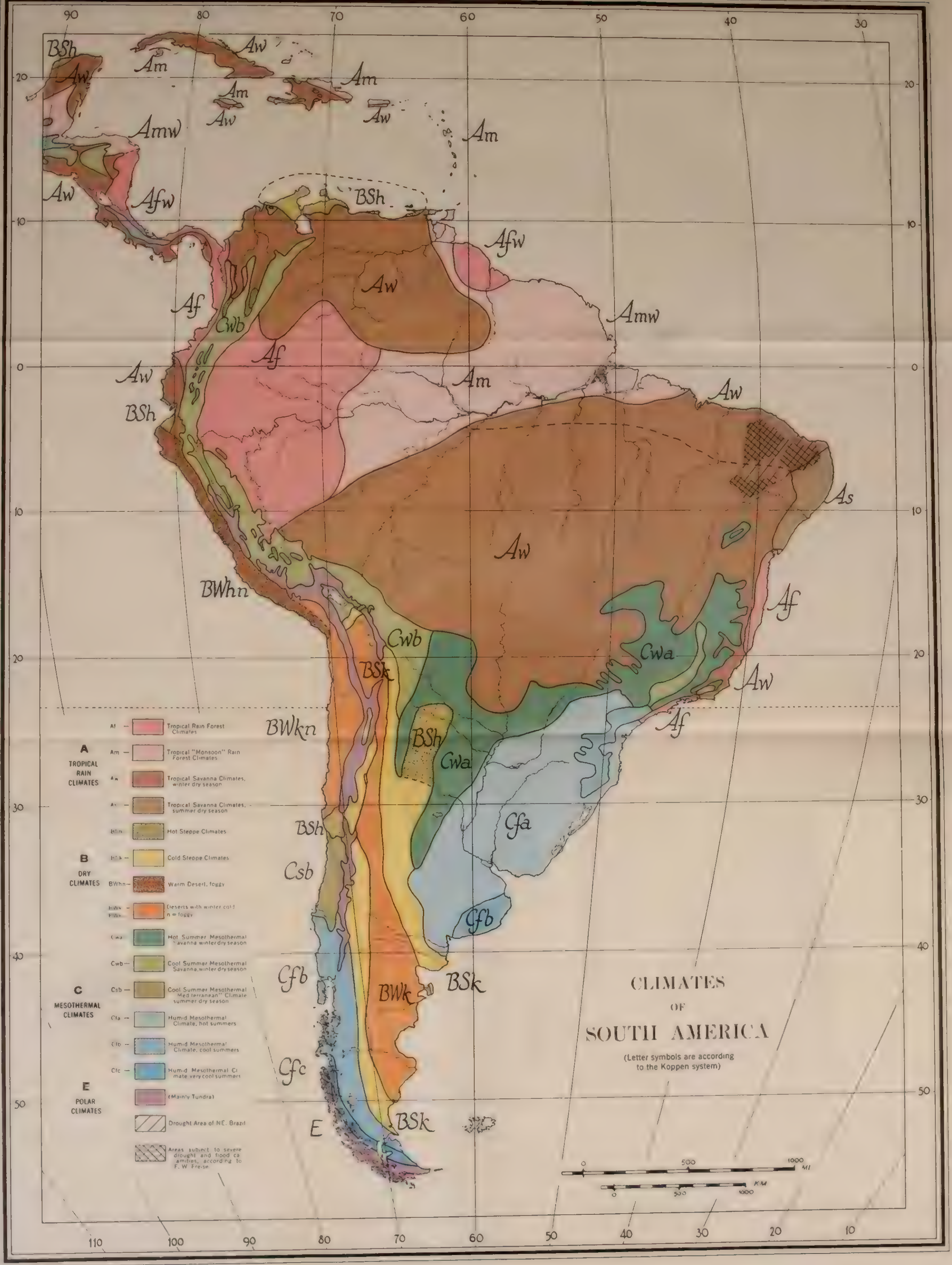

CLIMATES OF SOUTH AMERICA

(Letter symbols are according to the Koppen system)

A
TROPICAL RAIN CLIMATES
Af — Tropical Rain Forest Climates
Am — Tropical "Monsoon" Rain Forest Climates
Aw — Tropical Savanna Climates, winter dry season
As — Tropical Savanna Climates, summer dry season
B
DRY CLIMATES
BSh — Hot Steppe Climates
BSk — Cold Steppe Climates
BWhn — Warm Desert, foggy
BWk, BWkn — Deserts with winter cold n = foggy
C
MESOTHERMAL CLIMATES
Cwa — Hot Summer Mesothermal Savanna winter dry season
Cwb — Cool Summer Mesothermal Savanna, winter dry season
Csb — Cool Summer Mesothermal "Mediterranean" Climate summer dry season
Cfa — Humid Mesothermal Climate, hot summers
Cfb — Humid Mesothermal Climate, cool summers
Cfc — Humid Mesothermal Climate very cool summers
E
POLAR CLIMATES
(Mainly Tundra)
Drought Area of NE. Brazil
Areas subject to severe drought and flood calamities, according to F. W. Freise
BSh
Aw
Am
Am
Aw
Am
Aw
Amw
Am
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Afw
BSh
Afw
Aw
Af
Cwb
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The great remainder of the Brazilian Highland, including almost the whole of Mato Grosso, Maranhão, and Piauí, is a plateau of sandstone, conglomerate, and shale, sloping westward to the Amazon lowland. Its margin against the Paraguay and Guaporé lowlands is an enormously long scarp, rising about 600 to 1,300 feet (200 to 400 m.) above the adjoining western lowlands. This scarp is cut into buttes and bastions by the headwaters of the Paraguay and Guaporé Rivers, and there bears the name of Serra dos Parecis. Its summit, however, stretches northward as a high smooth plain into the Mato Grosso and is there called the Campos dos Parecis. Relief in the sandstone plateau is a matter of dissection by streams; adjacent to large streams, or where drainage lines are closely spaced, it is a land of cliffs, mesas, and buttes; otherwise, the interfluves may be very smooth. In general, the soil is considered as thin and low in fertility.

THE CONTINENTAL LOWLANDS

Llanos of the Orinoco.—The Llanos of the Orinoco lie north of the Orinoco and Guaviare Rivers; west of the junction of the Orinoco and Apure Rivers, they form a plain like the North American Great Plains, rising steadily to the foot of the Andes, and traversed by streams descending from the Andes across a surface in part built up of their deposits. East of the Apure River, the Llanos are formed by a series of mesas, some of which drain north into the Caribbean Sea. These mesas are dissected by streams, with valleys about 600 feet (200 m.) deep. The mesa country abuts sharply on the delta of the Orinoco. The surface of the Llanos consists of varying sedimentary waste, cobbly, sandy, and clayey, in large part cemented at the surface or at slight depth into hardpan. The amount of alluvial land, aside from the delta, is not great along the Orinoco or its tributaries. Most of the plains have never been used for agriculture and probably never will be. Numerous streams of large flow, issuing from the Andes, have built broad fans, in part of good fertility, especially along the northwestern margin of the Llanos.

The Amazon Lowlands.—The lowlands of the Amazon River are shaped like a long-stemmed fan: The stem is the lower Amazon below its junction with the Madeira River; the flaring sides of the fan are contained between the courses of the Madeira and the Yapura Rivers.

The lower valley is a structural trough, with older formations, in part those of the Guiana and Brazilian Highlands, approaching close to the river, as for instance at the Garganta of Obidos. Since different parts of the upper Amazon Basin receive their rains at different times of year, the lower flow is somewhat equalized, and maximum flood heights are only around 20 feet (6 m.) The size of the flood plain is moderate compared to the volume of the river. Indeed, on its lower course, the alluvial plain is scarcely wider than that of the middle Mississippi, banks of high terraces accompanying the lower river. The flood plain (varzea) holds a loose braid of river arms and cut-offs; lakelike enlargements, especially at the mouths of tributaries, suggest a recent sinking of the land. The estuary of the Amazon River is not in any ordinary sense a delta; its mouths have been deeply drowned and the larger part of the principal island, Marajó, is elevated land with deeply weathered soil.

The broadly triangular interior basin of the Amazon, between the Madeira, Yapura, and Ucayali Rivers, the latter following the foot of the Andes, is a vast network of convergent, heavily meandering, and heavily flooding and depositing streams. The interfluve areas, however, are of markedly higher land, somewhat ridged by dissection of deeply weathered sediment, in part a gently rolling country of low hills. C. F. Marbut (1924) has estimated that in the whole of the Amazon Basin not more than 10 percent is alluvial land.

Llanos de Mojos.—The Bolivian share of the Amazon Basin is a markedly different country from the rest. Between the Beni River and Santa Cruz de la Sierra lie the Plains of Mojos or Mamoré, drained into the Amazon by way of the Madeira River. This is a vast alluvial plain, really flat, overwhelmingly subject to shallow flooding during the rainy period. Here and there low "islas" rise enough above the plain to escape flooding; these have been especially important as sites of habitation. The flatness of this country may be due to the barrier of rock at the rapids of the Madeira River (the innermost edge of the Brazilian Highland), which forms a base level for the country behind. At Santa Cruz de la Sierra the projecting inner knee of the Andes and the farthest outliers of the Brazilian Shield approach to within 200 miles (300 km.) of each other. This corridor, the Llanos de Chiquitos, still drains northward, but immediately south lies the land of the *Chiriguano*, the northern end of the Gran Chaco.

The Southern Plains, mostly in the La Plata Basin.—The plains between Santa Cruz de la Sierra and Patagonia include the following: (1) At the north the Gran Chaco, a remarkably smooth plain for the most part, alternately flooded and baked dry. It consists of light-colored soils, in the main, for climatic reasons. (2) South of lat. 30° S., with change of climate the Chaco is replaced by the (*a*) black earths of the Pampa, which again change westward and southward, with increasing dryness, into the (*b*) brown soils of the Monte. The differentiation of these areas is, however, a matter of climate and vegetation rather than of surface. As to surface conditions, there is nothing more to be said than that they are plains with few and shallow valleys. (3) The Paraguay-Paraná lowlands constitute one of the world's great areas of alluviation. The usual width of the alluvial belt is greater than along the Amazon River. (*a*) The upper Paraguay River, between Cuyabá and Corumbá, in Brazil, floods an enormous basin, which is for the most part permanently swampy and comprises El Pantanal, probably the largest swamp in South America. Here alluviation is in process of burying the far interior outliers of the Brazilian Highland. (*b*) South of Corumbá the drainage is only relatively better. Swamps and backwaters (pantanales and esteros) extend into the basal parts of the hill country of Paraguay, and a great reach of alluvium lies along the western or Chaco side of the Paraguay River. (*c*) In the Paraná Valley of the Argentine, natural levees, "old rivers," subparallel tributaries, and other features are reminiscent of the lower Mississippi Valley of North America. (4) East of the Paraná River, and especially east of the Uruguay River, is a country that is intermediate between the Pampas of the Argentine and the Brazilian uplands. Its geology is that of Brazil, an area of eruptive and sedimentary rocks. Relief and elevation are slight, though the plains are over-topped here and there by cuestas and low ranges of resistant rock. In the smoother parts the land is made of materials that are intermediate between the black lands of the Pampas and the red lands of the Brazilian uplands. It is a transition area in every respect, reckoned perhaps better to the lowlands than to the uplands. The name "Uruguayan Pampa" is applied to the southern part of these plains.

THE PATAGONIAN PLATEAU

East Patagonia or the Patagonian Plateau is built of many kinds of rock ranging from ancient granites to basalts of late age, with a great range of sedimentary beds between. Horizontal surfaces predominate, heavily covered with cobbles and gravels, especially in the eastern part. Numerous terrace-flanked valleys descend from the Andes to the sea. It should be noted that most of the Strait of Magellan and Tierra del Fuego physiographically are part of Patagonia.

THE WESTERN CORDILLERAS AND LOWLANDS

West Patagonia.—The southernmost part of the Andes, south of the Gulf of Ancud, is a young mountain range erected out of much the same ancient rocks as form the core of Brazil. This range has been subjected to heavy glaciation (moraine-dammed lakes lie at the foot of the Andes north to lat. 39° S.). Its coast line is one of the best-developed fiord coasts of the world. Beyond lat. 47° S. glaciers reach the heads of the fiords. A curious feature of the mountains is that they are completely traversed east-west by low basins, in which lie chains of lakes. Morainic dams across such basins, lying well east out on the Patagonian Plateau, divert water across the range to the Pacific.

Old Chile.—This area stretches from Coquimbo south to Chiloé Island and consists of three parallel strips: (1) In the interior the high, simple chain of the Andes, in the main of sedimentary rock, on which, south of Santiago, are superimposed a series of volcanoes. This sierra is deeply excavated by streams, which have eroded it to a narrow, sinuous crest line. On the Chilean side the lower snow line rises from 4,900 feet (1,500 m.) at the south to 15,000 feet (4,500 m.) at the north; on the drier Argentine side it is higher. (2) At the western foot of the Andes is the Valle Lonjitudinal. As a continuous depression it begins a short distance north of Santiago and extends south to pass beneath the Gulf of Ancud. Northward it is continued as a string of small basins to Coquimbo. The basins are deeply aggraded with waste of the mountains, especially by coalescent fans from the Andes. The northern area has weathered into productive chestnut-brown soils; south of Concepción increasing podsolization characterizes the soils and diminishes their fertility. (3) A coast range, containing old crystalline rocks at its core, stretches the entire length. Drainage is generally by valleys that cut directly across the coast range. The antecedent streams descending from the Andes have held their seaward course during the late uplift of the coastal mountains. On the seaward side is an impressive development of discontinuous terraces.

The Pampean Sierras.—The Argentine provinces of the northwest, Córdoba, Tucumán, Catamarca, La Rioja, San Luís, and San Juan, occupy a series of ranges and basins that are southeastern outliers of the Andes. Here an ancient part of the crust, to which have been added later volcanics, has been buckled and broken by the Andean orogeny into a series of long north-south blocks. Aggradation has filled the floors of the intervening basins. The landscape is similar to the North American Great Basin, but the ranges are of greater relief (the Sierra de Famatina rises to nearly 21,000 feet (6,400 m.)). Many small streams descend from the ranges and form well-watered alluvial cones at their bases.

The Bolivian Plateau.—Northward from the Chilean Province of Coquimbo, north of latitude 28° S., the design of the Andes changes and becomes a double and multiple chain. In northeastern Chile the saline basins (salares) of Pedernales and Atacama, at about 8,200 feet (2,500 m.), are wedged between two chains. East thereof, across the main Andean Cordillera, and in the extreme northwest of the Argentine, is the Puna de Atacama at about 11,500 feet (3,500 m.), a cold, arid plateau with feeble streams descending into it and ending in salt flats. Still farther northeast additional parallel cordilleras, with high narrow basins between (Argentine States of Salta and Jujuy), form a link between the Eastern Andes of Bolivia and the Pampean Sierras. The northeastward rise of intermontane surfaces to constitute dry, cold plateaus, overtopped by north–south cordilleras, marks the transition from the Argentine and Chile to the Bolivian Plateau.

In Bolivia three main ranges may be recognized: The great western wall that rises from the Coastal Desert of Atacama (not to be confused with Puna de Atacama); a central range swinging north on the eastern side of Lake Poopó, Oruro, and La Paz; and at the northeast, the Sierra de Cochabamba, which descends to the Amazon Plain. The land between the western and the central cordillera is an undissected, cold plateau or puna, of interior drainage, windswept flats, salt marshes and salty lakes, with lesser buttes and ridges upon it. To this area may be reckoned the basin of Titicaca with its sweet-water lake. The extreme length of undissected and undrained Andean plateaus then (including the basins described in the preceding paragraph) would be from below the Nudo de Vilcanota in southern Perú (about lat. 14° 30′ S.) to the Volcán de Copiapó in Chile (almost in lat. 28° S.). East of the central Bolivian Cordillera (various names, e. g., Cordillera de los Frailes) an originally similar puna surface, made up of old and partly lithified alluvial waste, has been dissected by terrace-bordered streams, flowing eastward and southeastward out of the Andean Highland. The remnants of the plateau surface are around 13,000 feet (4,000 m.), more or less the same as in the undissected puna, but the valleys are trenched far below that cold level.

The Peruvian Andes.—The Peruvian Andes also have parallelism of cordilleras with intervening puna surfaces. The cordilleras form a loose braid, the strands diverging and converging into knots (nudos). The old basin surfaces of the puna range from more than 13,000 feet (4,000 m.) at the south to considerably less than 10,000 feet (3,000 m.) at the north. Drainage is complete in the Peruvian Andes, and all the old basins are cut through by valleys. The westernmost cordillera is the main watershed. From it streams flow to the Amazon River, finding their way northwestward between parallel ranges and gradually breaking across them into the Montaña, or eastern Andean slope opening into the Amazon Lowlands. Interior Perú is an undulating high plateau, overtopped by ranges 3,000 or 6,000 feet (1,000 or 2,000 m.) higher, and incised by streams flowing mainly north in terrace-bordered barrancas that may lie as much or more lower.

The arid West Coast.—From Copiapó (lat. 28° S.) to Pisagua (lat. 19° S.) no permanent stream reaches the Pacific Ocean. This is the stretch most properly called the Desert of Atacama; even the slopes of the Andes are bare to about 8,000 feet (2,500 m.). Andean torrents carry their deposits westward into basins that resemble the Valle Lonjitudinal of Central Chile, except for their aridity. These long basins have been deeply filled with alluvium and impregnated with alkali; they are the famous nitrate basins of North Chile, the pampas of Tamarugal and Paciencia, and other pampas. On their seaward side is a low coast range, trimmed by waves into forbidding cliffs.

From Arica northwestward to the Bay of Pisco are discontinuous stretches of coast range remnants, such as the Peninsula of Paracas that shelters the Bay of Pisco. Behind such ranges lie pampas, rising at the east through steep fans to the Andean front. Mountain streams carry water at least seasonally to the sea and have formed deep incisions in pampa and coast range alike, with small but fertile bodies of alluvial land.

North of Pisco the sea has destroyed the old coast range, except for small, sparsely strewn islands extending from the Chinchas to the Lobos groups. Ica has a basin like those of the pampas to the south. North thereof, through the Province of Lima, a series of alluvial fans coalesce, their seaward margins cut by waves. In Ancash the sea washes the foot of the Andes, and the habitable surfaces are in mountain piedmont valleys rather than on alluvial fans.

The North Peruvian Coast plain stretches from the vicinity of Trujillo to Tumbez. Here behind detached, elevated Coastal fault blocks are the Plains of Tumbez and the dune-covered desert Plain of Sechura. Coastal dunes extend south beyond Trujillo. In the soft coast plain materials, sizable Andean streams have enlarged wide valley floors (Chiclayo, Moche, Chira), constituting the most extensive and valuable agricultural surfaces of the Peruvian coast.

The Ecuadorean Andes and Forelands.—Ecuador is in physical contrast to both Perú and Colombia: (1) The Coastal area is neither desert like Perú, nor rain forest like Colombia. Weathering, erosion, and deposition take the forms appropriate to a climate intermediate as to season and amount of precipitation, the conditions being those of a rather moist savanna. (2) A well-developed structural lowland runs north and south from the Gulf of Guayaquil to Esmeraldas. (3) Its southern end has been drowned to form the Gulf of Guayaquil, the largest embayment on the Pacific Coast north of the Gulf of Ancud. This drowning of a strongly alluviating lowland has given rise to a tangle of estuaries, swamps, and overflow lands. (4) West of the longitudinal valley a poorly known hill land stretches along the sea, principally in the Province of Manabí. It appears to lack striking features and to be a rolling upland, in part a plateau, with soils of varying attractiveness. (5) The Andean belt is extraordinarily narrowed in Ecuador, and here only is properly called a double range, the crests of which are only 60 miles (100 km.) apart. (6) The whole inter-Andean stretch is a series of high basins (hoyas), separated from each other by cross ranges (nudos). Drainage of one is to the Amazon River; of the next to the coast. (7) From Cuenca northward the Andes are surmounted by great volcanic cones, such as Cotopaxi and Chimborazo. (8) Especially on the eastern Andean flank, erosion has uncovered the old igneous and metamorphic base, which contributes auriferous sands to the piedmont streams of the Oriente, as the Montaña is called in Ecuador.

The Northern Andes.—In this area may be placed not only western Colombia and northern Venezuela, but also at the east, the Islands of Trinidad and Tobago, and at the west, Panamá as far as the Bay of David. North of Ecuador the Andean chains diverge sharply, with an easternmost chain trending straight east along the coast of Venezuela and across the Island of Trinidad. At the northwest, a chain of Andean structure forms the Isthmus of Panamá. Between lie several chains running northward to the Caribbean Sea and between the chains are structural basins, drained northward by streams and forming southward gradually rising and open passageways from the Caribbean Sea and Central America to the high Andean plateaus.

(1) Most important is the easternmost cordillera, that of Bogotá, with its wide, cold, rolling summit plateaus (páramos) and high lagoon-studded basins (savannas). The Cordillera of Mérida in western Venezuela is a continuation, as are the markedly lower ranges farther east, along the Venezuelan Coast. (2) The broadly oval basin of Maracaibo, with fresh-water lake in the center, bordered by extensive swamps, lies between the Sierra of Mérida and (3) the Cordillera of Perija connecting with the high, granitic Sierra Nevada de Santa Marta. The latter looks down from an elevation of well above 17,000 feet (6,000 m.) on the Caribbean Sea and is the highest range adjacent to Atlantic waters. (4) The course of the Magdalena River is through long basins, the upper one partly aggraded from volcanic sources, the lower part widening out into (5) the broad basin of northern Colombia, comparable to that of Maracaibo, but filled to form an alluvial land, heavily interspersed with swamps and small lakes. (6) The central cordillera, between the Magdalena and Cauca Valleys, is dominated by volcanoes in the southern part; northward it descends to form the irregular Plateau of Antioquia. (7) The Cauca trough is best marked between Cartago and Cali (around 2,300 feet (700 m.) elevation); above, it rises rapidly 3,000 feet (1,000 m.) to the aboriginally important basin of Popayán. Still farther south the high basin of the Patia connects with the hoyas of Ecuador. (8) To the main western sierra, there is added (9) north of the Bay of Chocó a lower coastal range. (10) Between the two is the basin of Atrato and Gulf of Urabá, of evil repute because of their great rain-

forest swamps. (11) The coastal range is continued in the spline-shaped sierras of Panamá, which carry Andean structure and basal Andean igneous rocks to the volcanic country of Chiriquí.

In many parts of the northern Andes exposure of basal granitic and metamorphic rocks has resulted in the concentration of gold sands in bars of piedmont streams. From the Panamanian sierra of Veragua, through the upper reaches of the Atrato to the land of El Dorado about Bogotá, and beyond, eastward, gold had extraordinary cultural importance among the aborigines.

The Antillean chain.—Three dissimilar areas are to be noted:

(1) *The Lesser Antilles.*—These are a simple volcanic island chain from Grenada to St. Kitts, with deep rich soils on their piedmont slopes. The islands north of St. Kitts, however, are made up of mingled volcanic and marine beds and are not mountainous; Barbuda, in fact, is purely a low limestone plateau. The Virgin Islands are transitional in structure between the volcanic Lesser Antilles and the folded Greater Antilles.

(2) *The Greater Antilles.*—East-west axes of crustal deformation have determined the design of the large islands. (*a*) One of these swings across the Strait of Yucatán to determine the general form of Cuba; topographically, it is expressed principally in the Organos Range of western Cuba. (*b*) A second forms the Caymán banks and islands, the Sierra Maestre of south Cuba, and coalesces with the first in the Baracoa Highlands of the extreme southeast. (*c*) South of it lies a deep oceanic trough, extending from the Gulf of Honduras between the Caymáns and Jamaica, through the Windward Passage, and out to the Atlantic Ocean north of Haiti and Puerto Rico. (*d*) South of this narrow deep, the crust has been deformed to give rise to the islands of Jamaica and the Peninsula of Jacmel in Haiti. All the east-west axes of deformation are knotted together in the important central highland of the Island of Haiti, the gold-bearing Sierra de Cibao, from which the zone of Antillean folding runs east through Puerto Rico and the Virgin Islands.

Haiti is dominated by these east-west lines of structure. Almost the whole of the island is an alternation of ranges and basins, resulting from differential erosion, and the filling in of structural depressions. Puerto Rico has a central folded core, the northern and southern flanks being covered by limestones, and the drainage in general is transverse to structure and strike of the rocks, in contrast to Haiti. Jamaica has small areas of the deformed core exposed in the higher parts, such as the Blue Mountains, but is mostly covered with limestone beds, raised to form one of the notable tropical karst lands. Cuba has exposed discontinuously a backbone of igneous and metamorphic rocks, but in major part is covered by various marine sediments. The development of sink features is less advanced than in Jamaica. In general, Cuba appears to be in long-continued process of emergence by stages from the sea, for the island is mostly a series of broad marine terraces, ranging from 20 to more than 1,000 feet (6–305 m.) above sea level. Coral reefs screen large parts of the coast (the Jardines Islands off the southern coast).

(3) *The Bahama Islands.*—These low islands of porous, poorly cemented limestone have no counterpart southward, but find their nearest cognates in the peninsulas of Florida and Yucatán. To each piece of emerged land there is attached a larger area of shoal, or bank. This association of island and shoal gives a peculiar character to the human ecology of the Bahamas.

CLIMATE AND VEGETATION

(Maps 9 and 10)

TROPICAL RAIN FOREST (*AF* AND *AM* CLIMATES)

Chocó-Darién-Mosquito Coast.—The most extreme development of the rainy Tropics in our hemisphere is north of the equator, at the meeting place of the two continents. The west coast of Colombia, the Chocó country, and the old Dabaibo land are thought to have the heaviest rainfall of the New World, from 240 to 312 inches (6–8 m.) a year, without cessation or important diminution at any season. The swamps of the Atrato Basin are equally formidable at all times; the feeding streams know no low water, the basin is inundated by continuous drenching rains. On the Isthmus of Panamá saturated air and over-saturated ground are characteristic of the Caribbean side, however, with some respite from drenching in spring. The amount of rain here, is apparently from 120 to 240 inches (3 to 6 m.) a year. (The latter figure is from Greytown; Portobelo has 156 inches (4 m.).) Northward, along the Mosquito Coast of Nicaragua, the rainfall diminishes to about 120 inches (3 m.) at Cape Gracias á Diós; in the back country a permeable subsoil further diminishes the wetness of the land and the exuberance of the vegetation.

Gulf of Honduras Coast.—From Cape Gracias á Diós to the Cockscomb Mountains of British Honduras, the lowlands and lower mountain slopes are still tropical rain forest. Annual rain (between 72 and 120 inches (2 and 3 m.)) is sufficient to maintain heavy forests in active growth throughout the year, although there is an almost dry season in spring (heaviest rains in fall). The composition of the forest changes rather notably as against Panamá and the Gulf of Darién. The reason, however, is geologic rather than climatic: The Gulf of Honduras lies on the North American side of the old sea barrier between North and South America (across Nicaragua; land connection established at end of Tertiary). The Honduras forest, therefore, is composed predominantly of species identical with or similar to those of Mexico, whereas Costa Rica and Panamá vegetatively are largely South American.

Amazon-Guiana rain forest (*Af* and *Amw′* climates).—In these equatorial lowlands the change in temperature between seasons is negligible, that between night and day important. Day and night throughout the year are of almost equal length, and normally the cooling of the atmosphere at night is enough to bring a daybreak that is decidedly chilly. The most important climatic differences are those between the upper and the lower Amazon River. The former has a full humid tropical climate (*Af*), with abundant rains throughout the year, total amounts probably ranging between 72 and 120 inches (2 and 3 m.). In the middle and lower Amazon the rainy season develops strongly at the end of the calendar year, with bright weather and only occasional thunder showers from July to September (*Amw′* climate). Total rainfall is under 72 inches (2 m.). In the coast area, from the mouth of the Amazon to that of the Orinoco River, rainfall is again heavier (72 to 120 inches (2 to 3 m.), perhaps 156 inches (4 m.)), but in fall the majority of days are rainless.

The cessation of rain in the *Amw′* area is not sufficiently long to produce a suspension of plant growth; for agriculture the *Am* land is somewhat more attractive than the *Af* country, because the soil is more workable and better aerated as the result of the dry weather.

The native vegetation appears, within the Amazon-Guiana area, to be differentiated chiefly in terms of the drainage of the surface. (1) The coast of Guiana is a swamp savanna, or rather a great, coastal mangrove swamp behind which is a fresh water, swampy savanna (pripris), with clusters of palms (on drier spots?). (2) The igapo, or swampy river lowlands, are most frequently inundated and of reduced diversity of vegetation. Especially along the lower Amazon there are numerous wet prairies in the forest. (3) The higher flood plain, only inundated in the greater floods, and reasonably well drained naturally during most of the year, is called the varzea, with great variety of hardwoods, softwoods, palms, lianas, and epiphytes. (4) On the "upland" surfaces of the older beds, the terra firma, the best-known trees are the caucho (*Castilla*) and the Brazil nut or castanha (*Bertholletia*).

West Indian rain forest.—The Lesser Antilles of the eastern Caribbean are extraordinarily well exposed to tropical ocean air, and they have rainfall generally in excess of 72 inches (2 m.) annually. Slopes facing the sea may receive as much as or even more than 156 inches (4 m.) of rain a year. As is usual in these latitudes, the maximum of rain is in summer, when the trade winds are replaced by calms; the minimum occurs during spring. The heaviest rainfall in the West Indies is in northeastern Jamaica, where Moore Town records 220 inches (560 cm.) a year. The northern sides of Haiti, Jamaica, and Puerto Rico have well-developed *Am* climates, and supported, aboriginally, correspondingly heavy rain forests, now largely destroyed through cultivation.

Brazil Coast rain forest.—The coast of southern Bahia to the Rio Mucuri and again a strip about Santos have tropical warmth through the year and rainfall of and above 72 inches (2 m.), without a dry period. The Bahia coast is outlined by mangrove swamps, with tropical palms, *Cecropia*, and various dyewoods conspicuous in the lowland forests behind the coast.

THE MONTAÑA (BORDER OF *A* AND *C* CLIMATES IN THE ANDES)

The lower Andean slopes adjacent to the humid tropical lowlands are loosely lumped under the term "Montaña," the slopes in which rainy tropical and mesothermal climates meet. Adequate meteorologic observations are almost lacking in this area, and vegetational studies are too few to give a satisfactory picture of vertical or horizontal distribution of plants. In the northern Andes tropical temperature values appear to exist on the Andean slopes to an altitude of about 5,000 feet (1,500 m.). Moist air is rapidly cooled as it is carried up the mountain slopes; rainfall appears to increase steadily up-slope to an altitude of 8,000 or 10,000 feet (2,500, or 3,000 m.). The intermediate slopes (very roughly between 4,920 and 9,840 feet (1,500 and 3,000 m.)) are mesothermal (*C*) rather than tropical (*A*), and their upper levels are prevalently shrouded in cloud or mist. This is the land of the cloud forest, the famed Ceja de la Montaña, which has been little explored, and whose lichen-choked forests are almost uninhabited. The Ceja separates the puna Highland population from the tropical piedmont settlements of the lower montaña. Schematically, it might be said that the montaña is divided as follows: (1) The Ceja of evergreen, misshapen trees and scrub, cool, foggy *C* climate; (2) principally between 6,560 and 8,528 feet (2,000 and 2,600 m.), the mesothermal forests (warm *C* climate), known to us as the home of the cinchona; (3) at lower altitudes (upper levels of *A* climate), an exceedingly luxuriant tropical forest, including great palms, coca, cacao, *Castilla*, and *Hevea*.

It should be noted that in Colombia and Ecuador, where humid tropical lowlands (*Af* or *Aw*) flank the Andean Highlands on both the Pacific and Caribbean sides, forest conditions exist in the western ranges which are much like those of the Montaña of eastern Perú.

TROPICAL SAVANNA (*AW*)

Central America and West Indies.—This has been and is the most important tropical climate for human occupation. The climate is developed along southern and western coasts especially, in the lee of the trade winds, mostly below an elevation of 2,600 feet (800 m.). The range of mean temperatures as between the warmest and the coldest month usually is only 3 or 4 degrees, though it may reach 6 or 7 degrees Centigrade in northerly localities. The daily range of temperature, therefore, still exceeds greatly the annual range. The mean annual rainfall ranges, at different places, from about 32 to 63 inches (80–160 cm.). There are rainless months, but the dry season is not entirely without rain. Winter is the dry if not the rainless season; summer is the rainy season. In a good many localities, especially in the islands, there is a double maximum, at the time of sun overhead, with a second short period of low rainfall in July. In the majority of localities, winter dryness is sufficient to introduce at least a partial resting period for plants, but not the marked suspension characteristic of this climate in many parts of South America.

The name "savanna" is thought to have come from the *Arawak* of Cuba. On much of this island the Spanish discoverers found grassy plains, with clumps of palms or groves of yellow pine. The pine savannas of Cuba have their counterpart in the Bahama Islands and in the open pine woods of Florida. Elsewhere about the Caribbean Sea and Central America the *Aw* climate is not typically represented by grasslands; where such occur, the association of grass seems to be with flat surfaces and heavy soils that reduce root penetration.

On alluvial lowlands the vegetation, both as to composition and size, is much the same kind of forest that develops in the *Af* climate. On hill slopes, terraces, and average coast plain it is monte alto, a woodland in size between forest and brush, consisting of scattered trees of large-growing species, as the guanacaste (*Enterolobium*), with a great variety of shrubby species between. Areas of thin, dry soils may be covered by thorn scrub and spiny succulents. Climbing and clambering plants are numerous (vine ferns, clambering canes, cactus, smilax, the latter the sarsaparilla of early export from the islands). The majority of species are deciduous; during the dry season spots of green are made by palms, the succulents, and by certain evergreen trees (the guyacán (*Guaiacum* or *Lignum vitae*) and tropical "cedar" (*Cedrela*), which belongs not to the Pine, but to the Chinaberry family).

The alternation of wet and dry season is expressed in a strange and varied plant chemistry. There are dye-woods in number (fustic of genus *Chlorophora*, the spiny Campeche wood, logwood and brazilwood of the genus *Haematoxylum*, dividivi and brazil of the genus *Caesalpinia*); extraordinary concentrations of tannin in bark, root, and seeds of many genera; copal gum from the genus *Bursera* (syn. *Elaphrium*); poisons and drugs of many kinds (e. g., in the Spurge family various species of *Euphorbia*, *Croton*, *Jatropha*, *Hura*, *Hippomane*); and cotton trees (*Ceiba*, *Bombax*). Two of the most numerous and economically diversified families are the mimosas and beans. Of the latter, we have here not only the ancestral home of the cultivated lima, kidney, and navy beans, but of woody forms the Balsam of Perú, or Tolu Balm (*Toluifera*); native anil (*Indigofera*); several sources of barbasco to stupefy fish (*Lonchocarpus*, *Piscidia* syn. *Ichthyomethia*, *Erythrina*, *Cracca*); and others from which a variety of poisons (*Abrus*, *Sophora*) and dyes (*Diphysa*) are obtained.

Savanna climate of the Orinoco and Magdalena Basins.—Observational data are still very inadequate. Caracas, at an elevation of 3,418 feet (1,042 m.), has an average annual rainfall of 32 inches (80 cm.), extremes lying between 19 and 47 inches (50 and 120 cm.). More than half the annual rainfall comes between June and September, winter and spring being dry, but not rainless. (In vernacular use in many places of northern South America and Central America, the rainy season is called winter, in contrast to the terms used here.) The dry season is more marked and longer than in the West Indies or Central America.

Streams descending from the cordilleras into the flat and wide basins of the lower Magdalena and the Maracaibo Rivers flood broadly and for long periods. Here, therefore, swamp and flood plain forests of tropical rain-forest type are developed. Farther inland and upgrade these are narrowed into gallery forests, along the stream courses. Such also are the gallery forests of the Orinoco River, in places developed as pure palm stands (morichales). North of the Orinoco River and east of Lake Maracaibo are areas of thorn scrub (chaporrales). The larger grass savannas appear to be in the Meta and Apure drainage of the Llanos, the reduced reality of the old picture of the great grassy plains of the Llanos of the Orinoco.

Brazilian caatinga and campos.—The driest part of Brazil is in the northeast, in and behind the State of Rio Grande do Norte, where certain small areas probably are steppe (*BS*) rather than savanna (*AW*). The northeast is also subject to notable irregularity in amount of rainfall, resulting at uncertain intervals in disastrous droughts (seccas) uncommon to such altitudes. Between Natal and Bahia, the season of rain shifts to the winter months; elsewhere there is mostly a simple summer or fall maximum, with a long, dry, even rainless winter and spring. Southward and westward there is a gradual increase in the amount of rainfall and the length of the rainy season. In the Llanos de Mojos the annual rainfall probably is around 72 inches (2 m.); it is still an area of marked contrast between summer rain season and winter dryness, of floods in summer, of dried-out stream beds in winter.

The common characteristic of the vegetation is adaptation to resting through the long time of rainless skies. Under conditions of minimum rainfall (and coarse-textured soils) it forms an association of coarse grass, with sparse low woody plants and cacti (sertão; the term also has a wider meaning of waste land). The northeastern highland for the most part is occupied by caatinga, similar to the monte of the Pacific Coasts of Central America and México, but with more sharply developed tropophytism, owing to the sharper antithesis of wet and dry seasons. A scrub forest of gray, bare trunks in the dry season, it is quickly turned green with the rains. The under story is well populated with cacti and bromelias. Spines and thorns arm most plants, woody, succulent, or herbaceous. Gallery forests composed of a variety of tropical hardwoods and palms (carnauba, buritî) line the banks of the São Francisco River and its tributaries. Westward and southwestward, into Goias and Mato Grosso, grassy savannas (campos) lie on smooth uplands, gallery forests of tropical luxuriance with groves of miritî and buritî palms reach up the major stream courses. Probably more widespread are the campos cerrados in which, as in the savannas of the north, the grasslands are sown with tropophytic scrub. The name Mato Grosso, given to the great interior State and signifying "great forest," originated in the Cuyabá area of the south, where the swamp forests of the upper Paraguay River meet the farthest interior extension of the Amazonian forests along the Guaporé River. It is misleading, therefore, as a vegetational term for the great interior and northern parts of this State.

STEPPES AND DESERTS

Caribbean scrub steppes.—Most of the southern shores of the Caribbean Sea are characterized by marked aridity. At the west the semiarid coast begins at the western base of the Sierra de Santa Marta; the Peninsula of Goajira is mostly covered with thorn scrub (especially dividivi), grass, and cactus. The Peninsula of Paraguaná, which forms the Bay of Coro, is said to lack all permanent streams and the adjacent mainland coast to be featured by thickets of huisache and cují (*Acacia farnesiana* and other species). The rainfall records at La Guaira and Cumaná show only 10 to 12 inches (25 to 30 cm.) a year, which are near-desert values. Eastward the Gulf of Cariaco and the islands of Cubagua and Margarita are desert, but a few miles beyond, the southeastern end of the Peninsula of Paria is covered by rain forest; rarely is as great a climatic contrast found in as short a distance. Offshore the Dutch islands, as well as the Venezuelan islands, are very deficient in rain (9–20 inches (24–50 cm.)) and have, moreover, high loss of moisture into the limestone beds of which they are composed.

In French Haiti the west coast of Gonaives (from Môle St. Nicholas to Gonave Island) is semiarid; in the Dominican Republic the Neyba Basin and Bay are even more so.

Arid West Coast.—From the vicinity of Trujillo in northern Perú to Copiapó in Chile, the Pacific Coast has mean annual temperatures averaging about 4 degrees C. below normal. This is also the area of greatest aridity, an aridity nowhere else approached in the New World. So absolute is this desert that long stretches of it are without visible plant life; no rain may fall for years, even well up on Andean slopes. The most arid section of all is northern Chile, its dryness lessened at times by sea fogs, especially in winter.

The Peruvian Coast, because of the northwest-southeast trend of both Coast and continent, is penetrated during the day by off-sea south winds, which bring some precipitation to the lower Andean slopes. In winter, fog banks form strongly along the Coast, dripping occasionally a mist called garua. Slopes exposed to the drifting fog then become covered with the quick green of grasses and herbs (loma vegetation). North of Lambayeque a broad cover of desert scrub (*Prosopis*) and cactus spread over the lowlands to the sea, and beyond the Ecuadorean border the Coast becomes semiarid rather than arid. The Ecuadorean Coast, from south to north, shows gradation from desert to tropical rain forest. The utility of the Peruvian Coast to man is high because numerous streams collect water from the high Andes to form oases of immemorial culture in the desert. Some have their sources beyond the crest of the western cordillera; others receive a fair summer run-off from rainfall on the higher, ocean-facing Andean cordillera.

On the Chilean Coast, on the other hand, a different morphology of Andes and Coast and also aridity extending to higher altitudes than in Perú reduce the streams to occasional torrents. Only south of Copiapó do streams of any importance flow to the sea; here also steppe vegetation covers the uplands, and winter rainfall increases steadily southward, so that beyond Coquimbo (lat. 30° S.) the arid lands are left behind.

The dry lands from Patagonia to the Gran Chaco.—Deficiency of moisture marks the east coast from the Strait of Magellan north to the Colorado River; in the interior marked dryness reaches along the Andean base north beyond the Pilcomayo River. This stretch of 2,000 miles of dry plains, basins, and plateaus includes (*a*) in the Chaco probably the highest summer mean temperature of the continent, (*b*) in the basins of Northwest Argentina the hottest summer days, and (*c*) in southern Patagonia almost the least amount of summer warmth at low altitudes. Patagonia experiences bitter winter cold; killing frosts extend far into the Gran Chaco. The Chaco has a tropical-rain regime, in its marked summer-rain, winter-dry periods; its winter temperatures, however, are too low for tropical climates.

The vegetation of the semiarid parts of the Gran Chaco is scrub forest, mixed with grassy plains, the latter apparently developing under conditions of flooding. Thorn scrub is dominated by mimosas, acacias, and great cactus thickets. The Argentine plains and basins west of Córdoba, sometimes called the Monte, or Chañar Steppe, are similar to the mesquite brush land of the Texas-Mexican border. Here undrained areas or areas of minimal drainage form bare salt pans, and broad fringes of useless salt bush. The Patagonian steppe is a mingling of low brush and clumps of bunch grasses. The maximum attraction to settlement always has been in the basin margins of Northwest Argentina, where mountain streams spend their waters on low fans, readily utilized for irrigation.

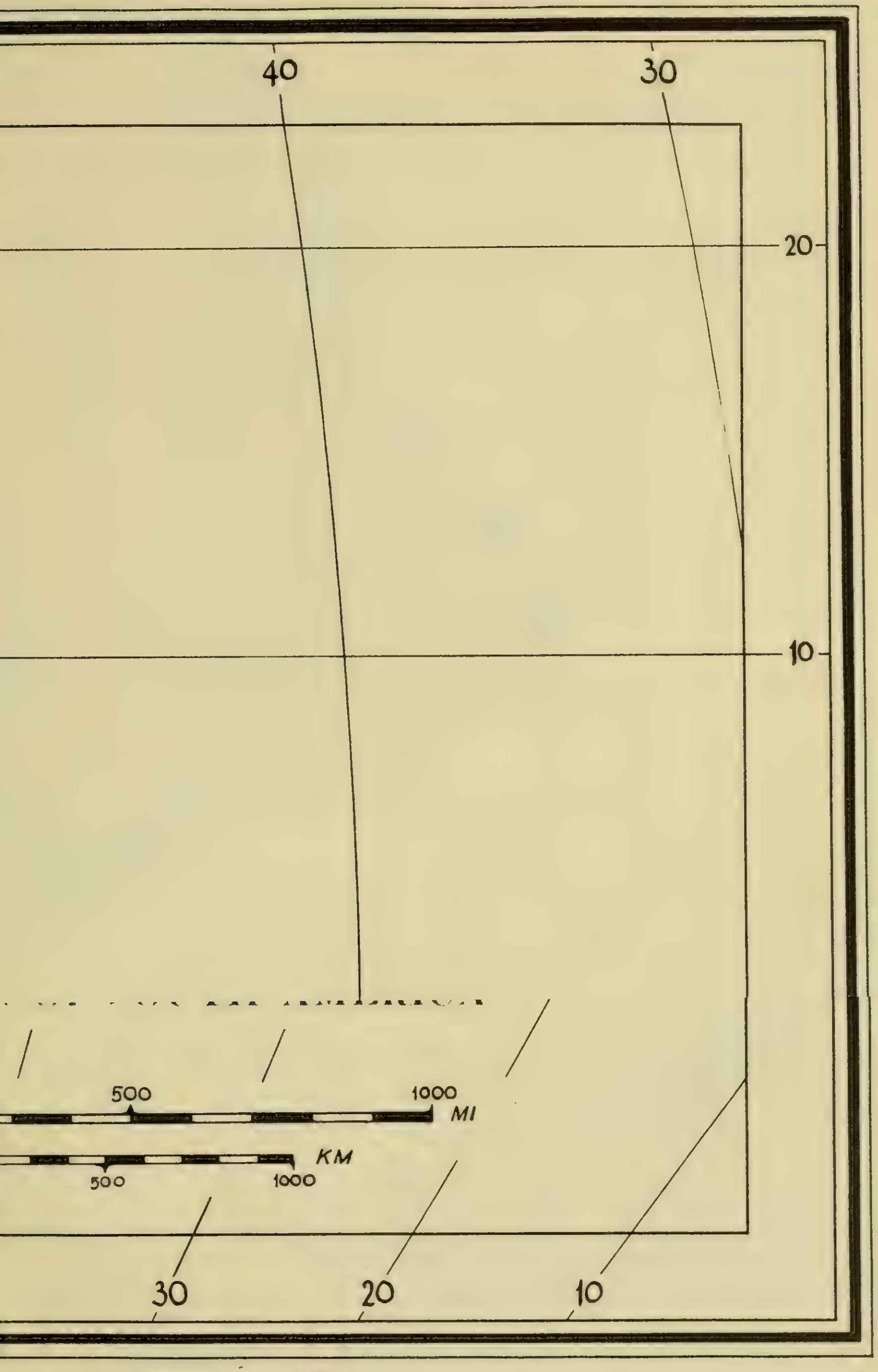
ANDEAN CLIMATE AND VEGETATION

Andes of Santiago and Mendoza.—Bleak, unforested slopes extend far to the south of both cities. The Andean slopes on the Argentine side are covered with cactus and scrub monte to the headwaters of the Neuquén River, where the Patagonian forest begins. On the Chilean side the southern forest extends somewhat north of Talca (about lat. 35° S.) on the lower Andean slopes. North thereof scrub occupies the lower mountains; at higher elevations are coarse Alpine grasses. The lower limit of permanent snow rises from about 8,200 feet (2,500 m.) at the headwaters of the Neuquén (lat. 37° S.) to about 16,400 feet (5,000 m.) between San Juan and Coquimbo.

Punas of Atacama and Bolivia.—The increase of rainfall from the Atacama coast desert to the Bolivian plateau is slow and slight. Ollague, the Chilean border station on the railroad from Antofagasta to Bolivia, at an elevation of 12,000 feet (3,700 m.), has an annual rainfall of 2 inches (6 cm.).

(1) The whole higher, western part of the Bolivian plateau and the Argentine Puna de Atacama are tundra, cold steppe, or cold desert, collectively called the puna brava. Cushions of llareta mingle with resinous tola heath and the harsh grass (*Stipa*), ichu, forming a sparse cover. Salt flats are bare of vegetation. The tola heath extends into the Peruvian high plateau behind Arequipa. (2) The basin of Lake Titicaca, sheltered within its mountain rim, is warmer, less

BULLETIN 143, VOL. 6, MAP 10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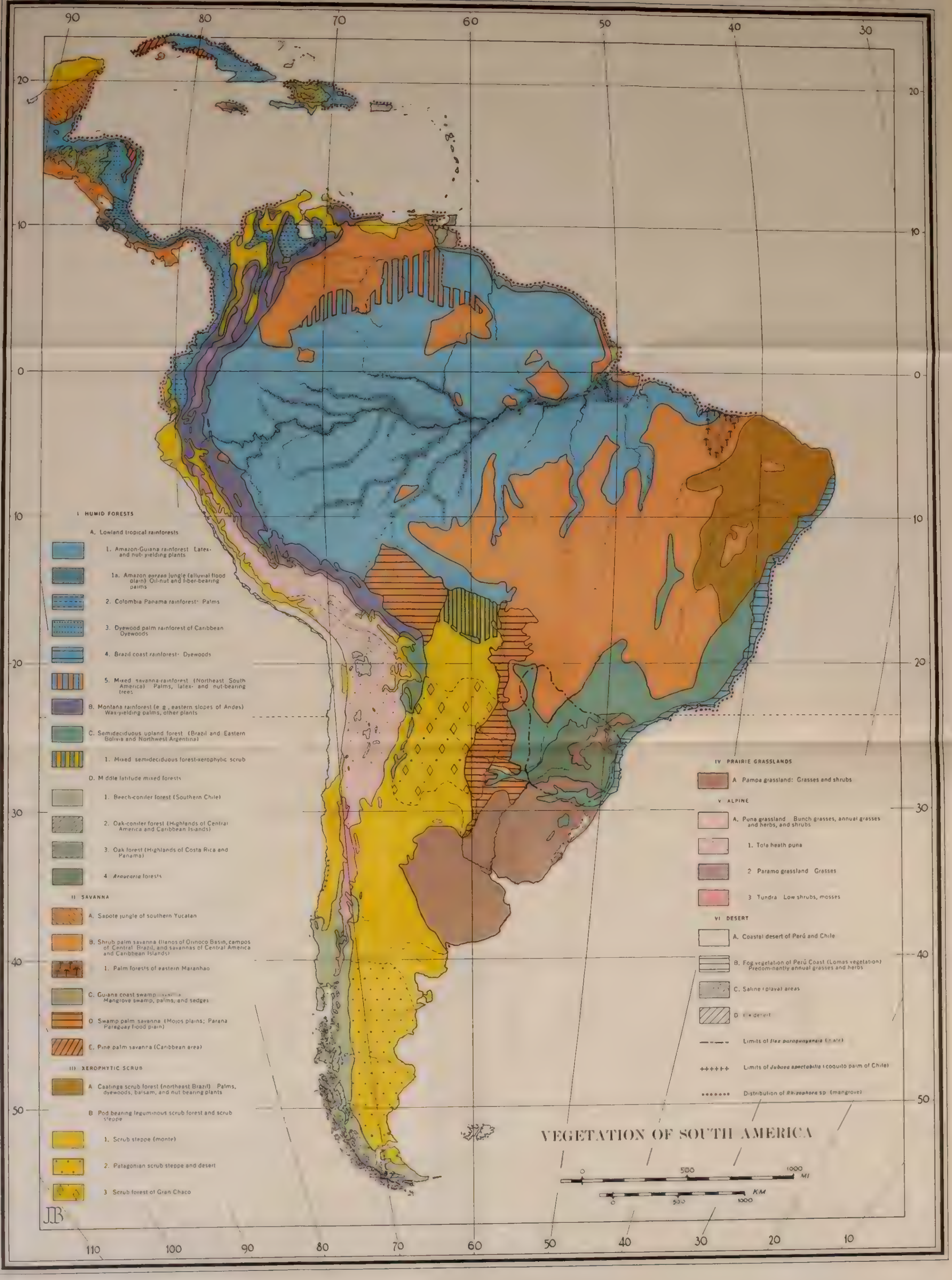
I HUMID FORESTS
A. Lowland tropical rainforests
1. Amazon-Guiana rainforest Latex- and nut-yielding plants
1a. Amazon *varzea* jungle (alluvial flood plain) Oil-nut and fiber-bearing palms
2. Colombia Panama rainforest: Palms
3. Dyewood palm rainforest of Caribbean Dyewoods
4. Brazil coast rainforest: Dyewoods
5. Mixed savanna-rainforest (Northeast South America) Palms, latex- and nut-bearing trees
B. Montana rainforest (e. g., eastern slopes of Andes) Wax-yielding palms, other plants
C. Semideciduous upland forest (Brazil and Eastern Bolivia and Northwest Argentina)
1. Mixed semideciduous forest-xerophytic scrub
D. Middle latitude mixed forests
1. Beech-conifer forest (Southern Chile)
2. Oak-conifer forest (Highlands of Central America and Caribbean Islands)
3. Oak forest (Highlands of Costa Rica and Panama)
4 *Araucaria* forests
II SAVANNA
A. Sapote jungle of southern Yucatan
B. Shrub palm savanna (llanos of Orinoco Basin, campos of Central Brazil, and savannas of Central America and Caribbean Islands)
1. Palm forests of eastern Maranhao
C. Guiana coast swamp [illegible] Mangrove swamp, palms, and sedges
D Swamp palm savanna (Mojos plains; Parana Paraguay flood plain)
E. Pine palm savanna (Caribbean area)
III XEROPHYTIC SCRUB
A Caatinga scrub forest (northeast Brazil) Palms, dyewoods, balsam, and nut bearing plants
B Pod bearing leguminous scrub forest and scrub steppe
1. Scrub steppe (monte)
2. Patagonian scrub steppe and desert
3 Scrub forest of Gran Chaco
IV PRAIRIE GRASSLANDS
A Pampa grassland: Grasses and shrubs
V ALPINE
A. Puna grassland Bunch grasses, annual grasses and herbs, and shrubs
1. Tola heath puna
2 Paramo grassland Grasses
3 Tundra Low shrubs, mosses
VI DESERT
A. Coastal desert of Perú and Chile
B. Fog vegetation of Perú Coast (Lomas vegetation) Predominantly annual grasses and herbs
C. Saline (playa) areas
D. [illegible] desert
Limits of *Ilex paraguayensis* (mate)
Limits of *Jubaea spectabilis* (coquito palm of Chile)
Distribution of *Rhizophora* sp. (mangrove)
0 500 1000 MI
0 500 1000 KM
JB
90 80 70 60 50 40 30
20 10 0 10 20 30 40 50
110 100 90 80 70 60 50 40 30 20 10

VEGETATION OF SOUTH AMERICA

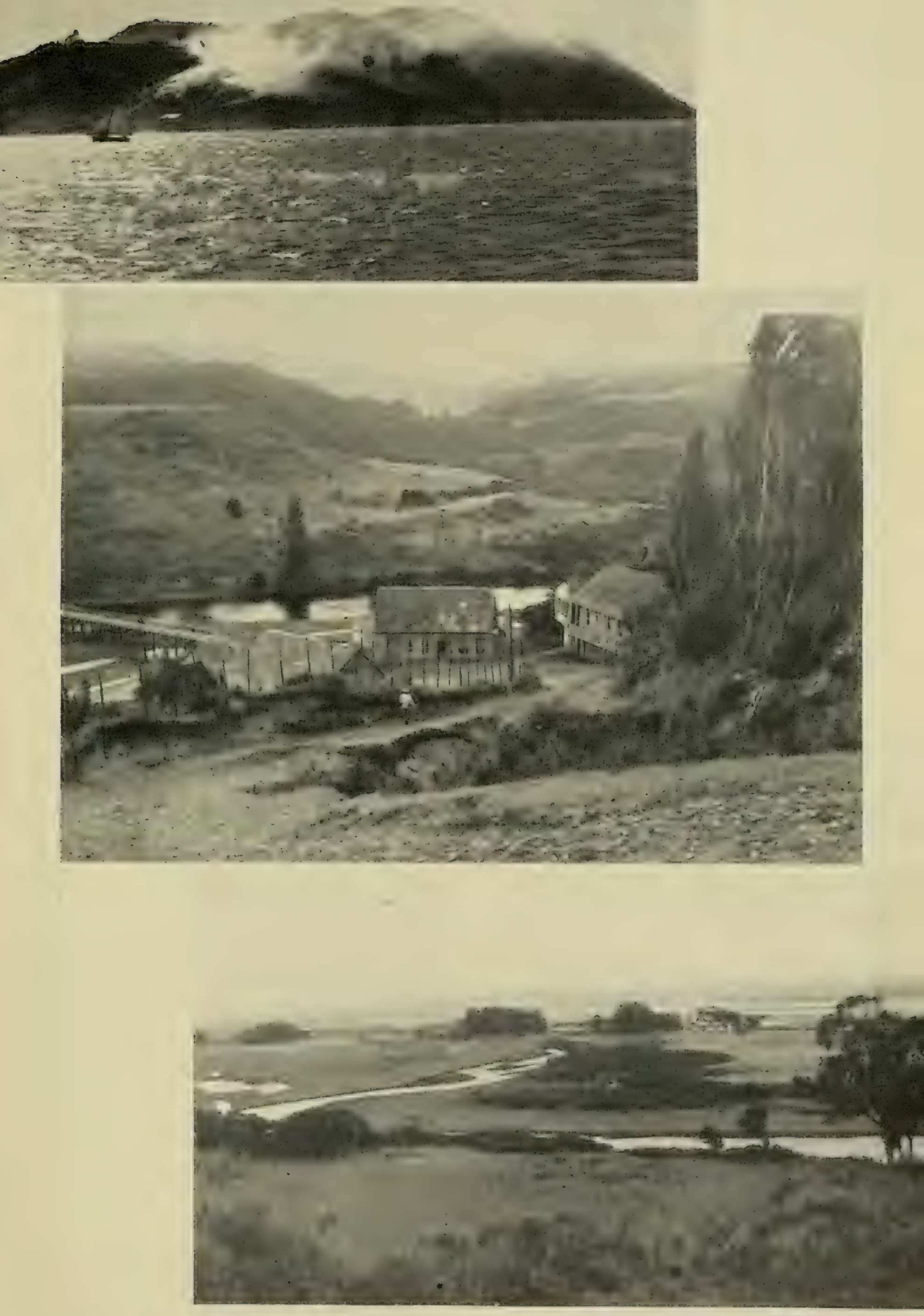

Plate 28.—Southern Chile. *Top:* Islands near Calbuco south of Puerto Montt. The fires are burning off the slopes to prepare for planting. *Center:* Terraces near Castro, Island of Chiloé. *Bottom:* Flood plain at mouth of the Río Bío-Bío. Trees are eucalyptus. (Courtesy Jonathan Sauer.)

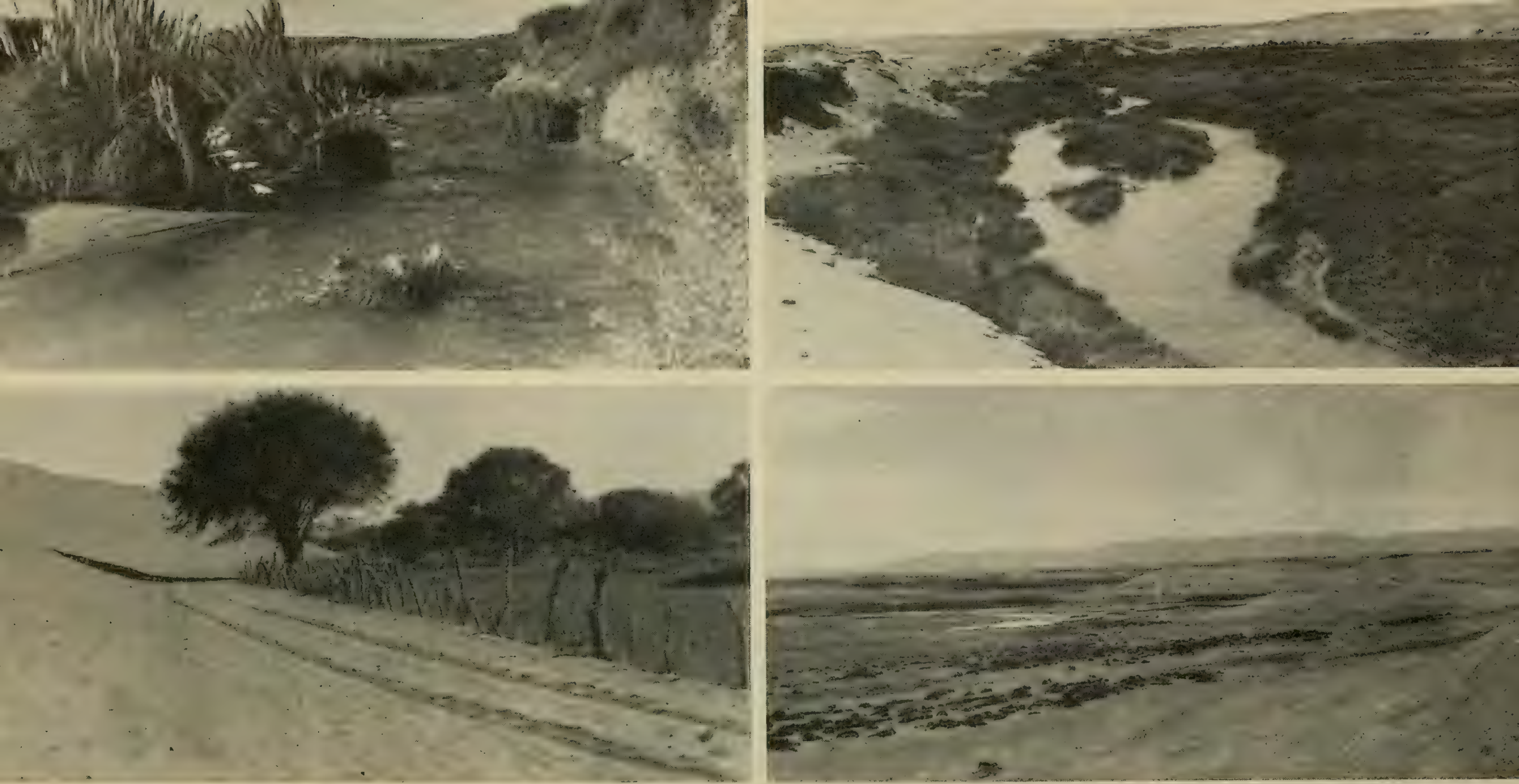

PLATE 29.—Northern Chile. *Top, left:* Pampas grass in vegas of Río Loa at Chiu-chiu. *Top, right:* Vegas of the Río Loa. *Bottom, left:* Line between desert and irrigated land, Oasis of Quillagua on the Río Loa. *Bottom, right:* Desert basin with scrub vegetation around margin, between Calama and Chiu-chiu. (Courtesy Jonathan Sauer.)

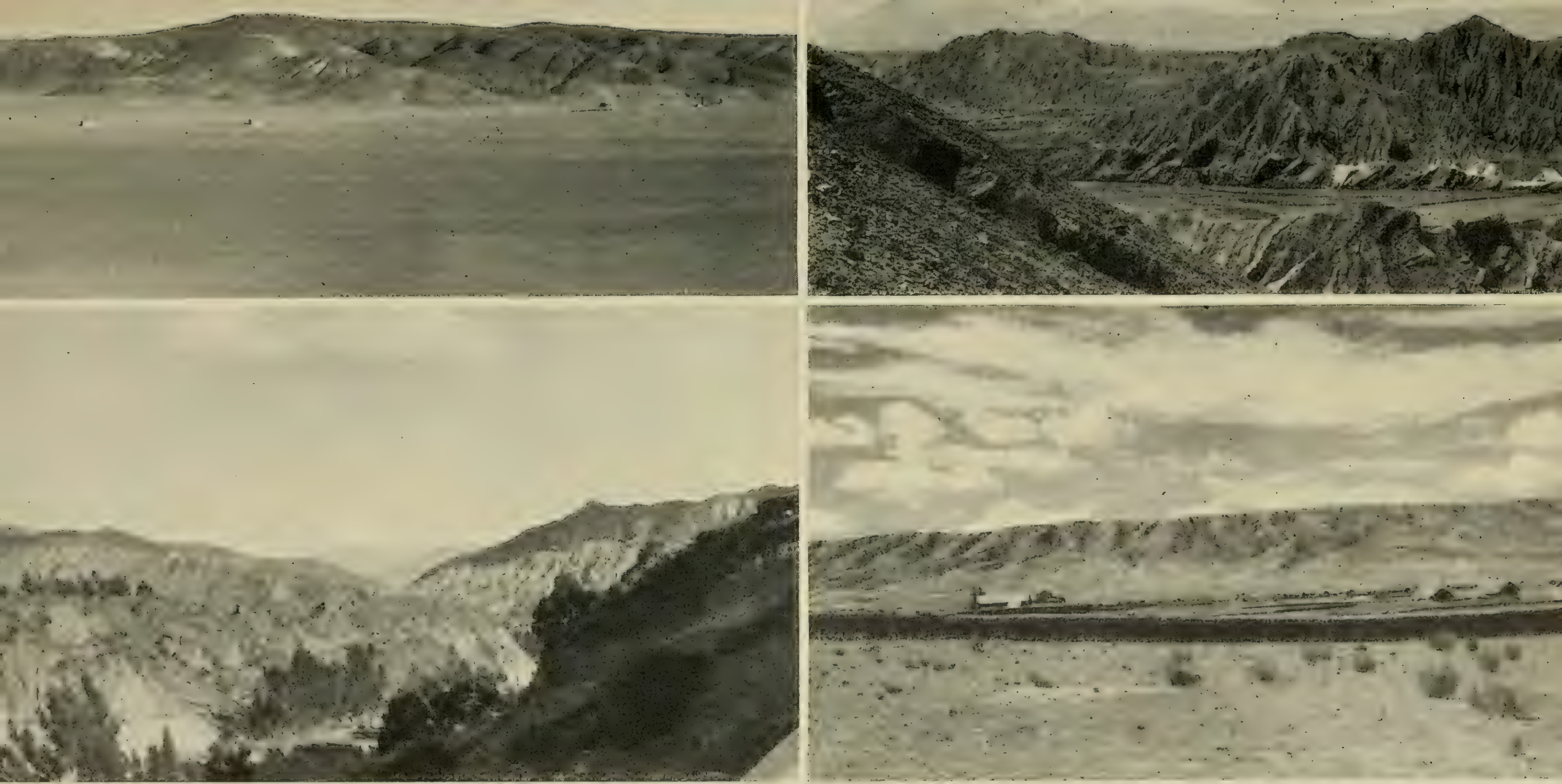

PLATE 30.—The Chilean Atacama and the Bolivian altiplano. *Top, left:* Completely barren Llano de la Paciencia near San Pedro de Atacama. *Top, right:* Badlands of Río San Pedro. *Bottom, left:* Badlands at the head of Yunga below La Paz. Vegetation is mostly introduced eucalyptus and pampas grass. *Bottom, right:* Eroded hills beyond Tiahuanaco. (Courtesy Jonathan Sauer.)

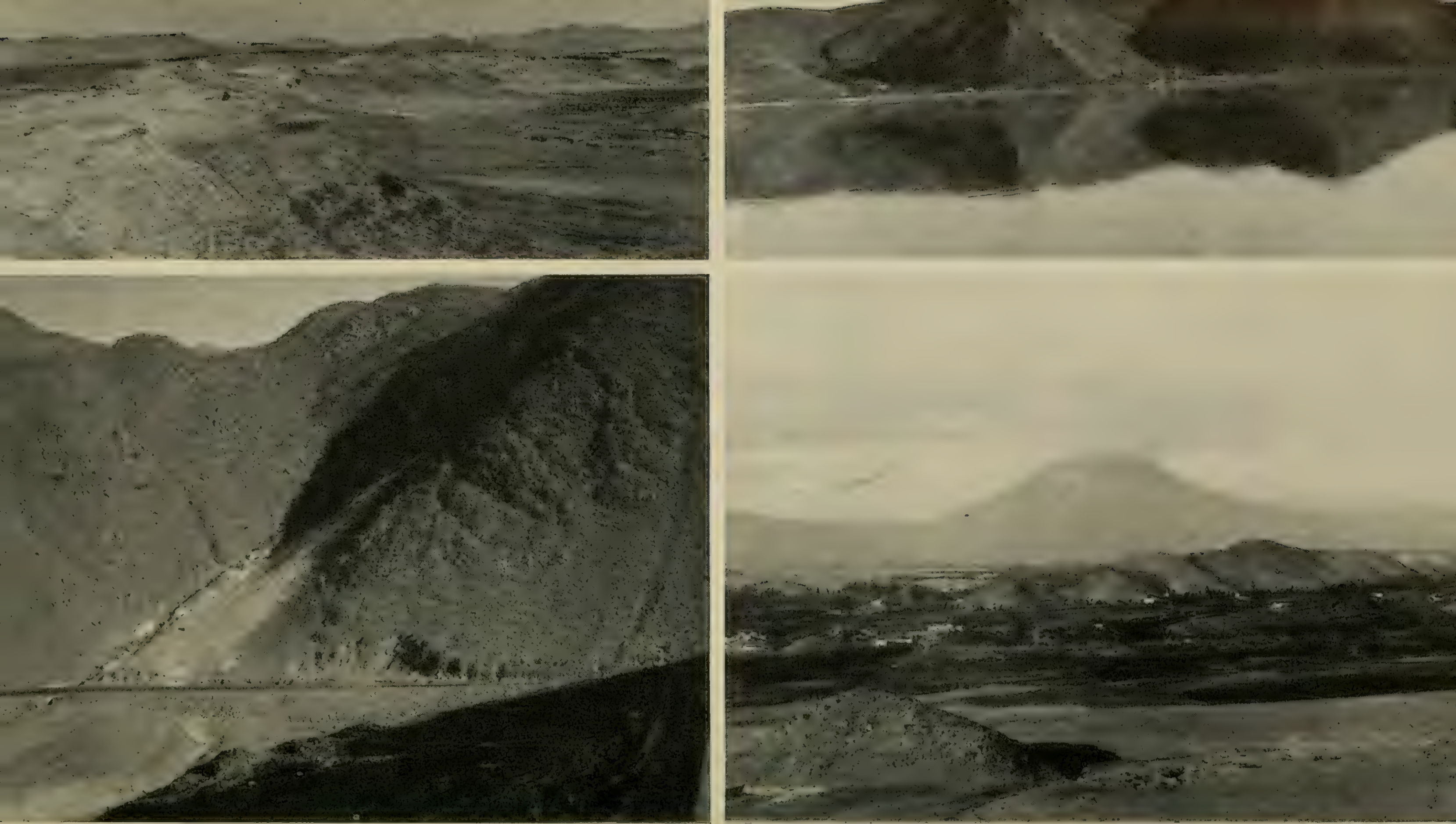

Plate 31.—The Chilean Atacama, Lake Titicaca, and Arequipa. *Top, left:* The Atacama between Calama and Chiu-chiu, showing scrub vegetation. *Top, right:* Peruvian shore of Lake Titicaca, with archeological terraces on the hills. *Bottom, left:* Wind-blown sand in sheltered spot of the hill near Arequipa. *Bottom, right:* Arequipa and Volcán Misti. (Courtesy Jonathan Sauer.)

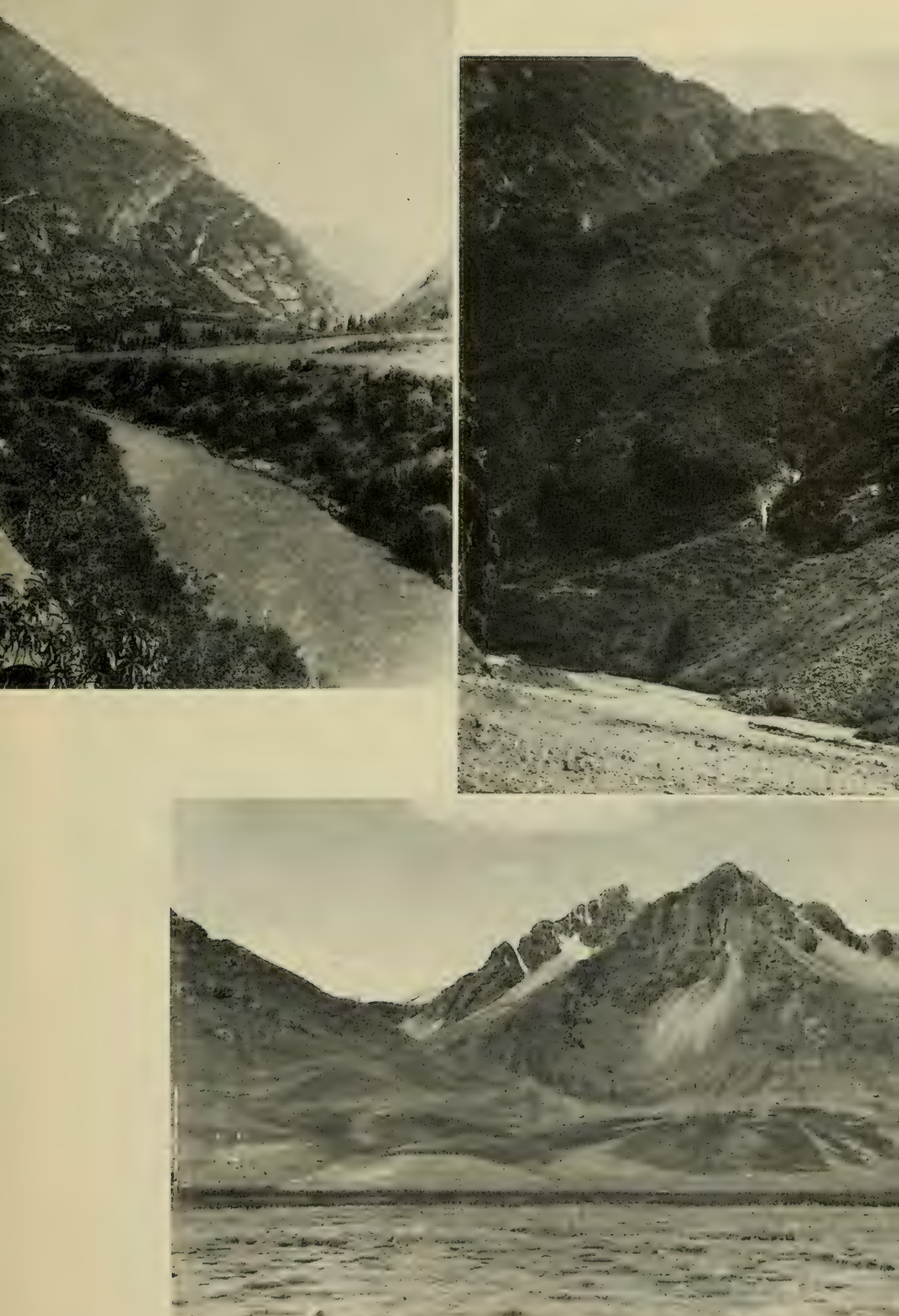

PLATE 32.—The Peruvian Andes. *Top, left:* Looking down Quebrada de San Salvador on Río Vilcanota below Cuzco. *Top, right:* Canyon of the Rimac a few kilometers below San Mateo. The terracing is archeological. *Bottom:* Pass at 14,020 feet with Nudo de Vilcanota in background and marshy llaneta in foreground. (Courtesy Jonathan Sauer.)

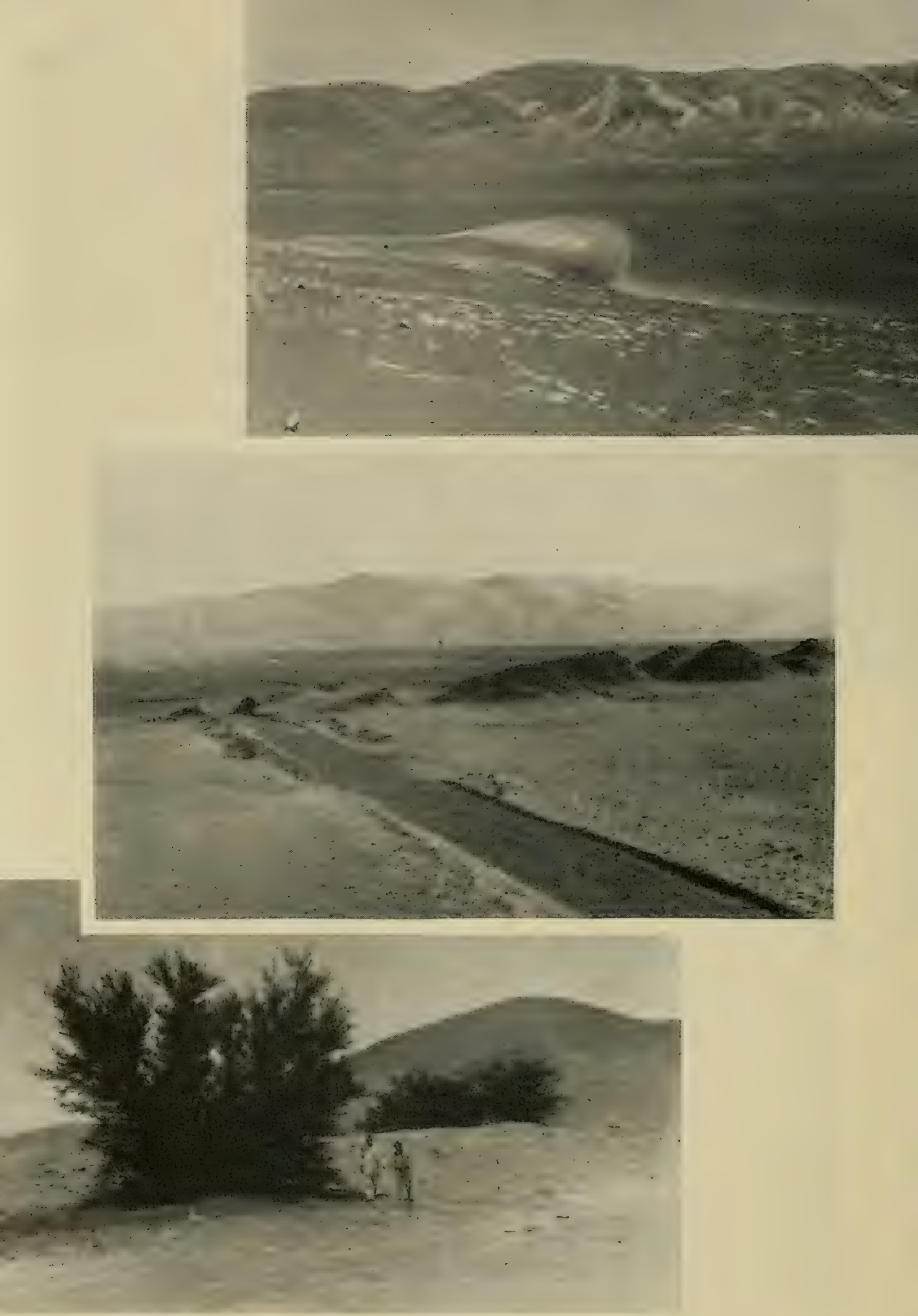

PLATE 33.—The Peruvian and Chilean coastal desert. *Top:* Crescent-shaped dune, or bancon, near Camana. *Center:* Hills covered with sand blown from a nearby ocean beach, north of Chala. *Bottom:* Tamarugos, *Prosopis* sp. (?), fed by ground water seeping into basin. Thirty kilometers north of Pintados, Tarapacá. (Courtesy Jonathan Sauer.)

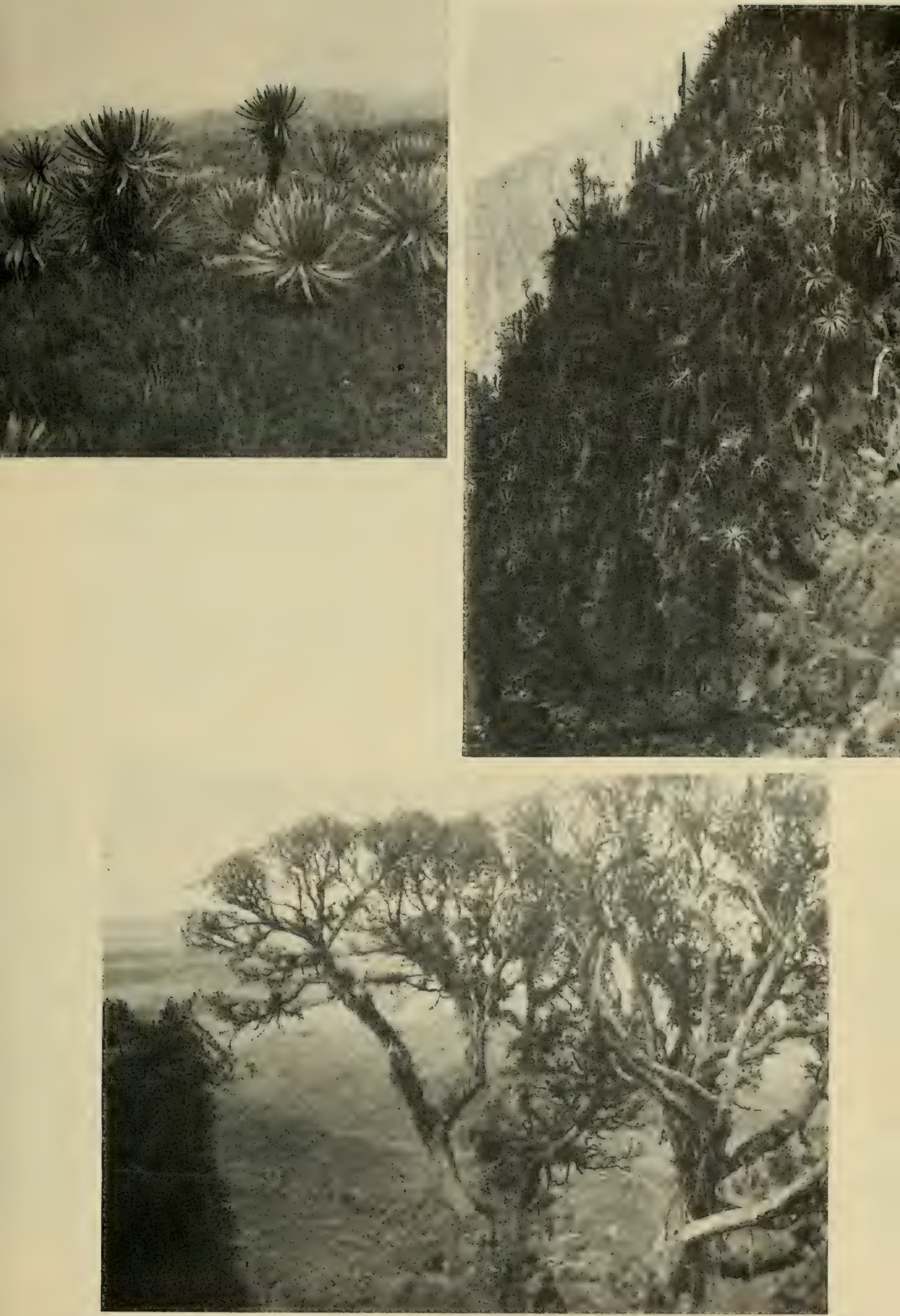

PLATE 34.—Andean vegetation types. *Top, left:* Frailejones (*Espeletia* sp.) on foggy paramo above Guasca, Colombia (elevation 3,400 meters). *Top, right:* Dry cliff vegetation on Río Urubamba, Ollantoytambo, Perú. *Bottom:* Ceja de la Montaña vegetation of 10,000-foot cloud belt, between Sibambe and Tambo, Ecuador. Trees are covered with epiphytes and parasites. (Courtesy Jonathan Sauer.)

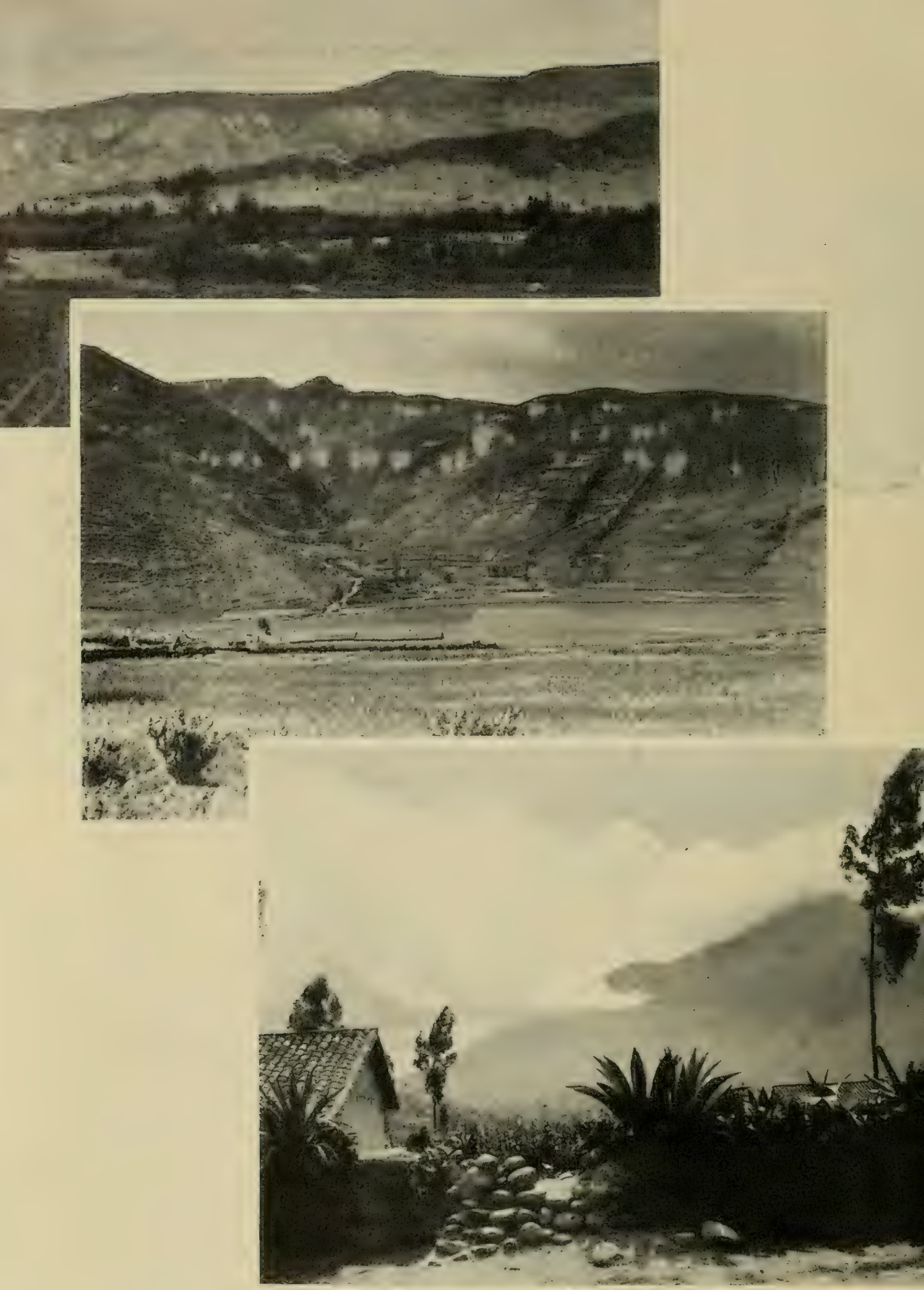

Plate 35.—Peruvian and Ecuadorean landscapes. *Top:* Oasis of Vitor in coastal desert west of Arequipa. *Center:* Eroded fields on sides of Río Vilcanota Valley at Tinta, south of Cuzco (elevation 3,470 meters). *Bottom:* The Ecuadorean Highlands near Otavalo. (Courtesy Jonathan Sauer.)

subject to temperature extremes, and above all rainier than the puna to the south; it is indeed mild and rainy enough to fall, barely, within the mesothermal humid climate (*Cwb*). Here agriculture can be carried on without irrigation, not only of Andean potatoes, but, with special care, even of hardy forms of maize. (3) In the dissected puna of central Bolivia, the elevations of the puna surface (12,500 feet (3,800 m.±) are covered with tola, llareta, and ichu, as to the west, and serve as pasture and fuel. Habitation here, however, is in general shifted into the warmer levels below the puna, in valleys sunk into the highland.

The East Andean flank of Bolivia and Tucumán.—(1) North of Santa Cruz de la Sierra the front of the eastern cordillera against the interior plains is covered by montaña forest, usually cloud blanketed to about 11,000 feet (3,400 m.). (2) Above the Chaco plains a heavy forest, including temperate-zone deciduous forms, covers the eastern slopes. It is well developed in the sierra behind Tucumán, its upper limit here only at about 4,600 feet (1,400 m.). (3) The inner ranges and valleys vary a good deal in terms of their exposure to moist air from the east or drier air from the south. A schematized division is often used: (1) The cabecera del valle, above 8,528 feet (2,600 m.); (2) between 8,500 and 5,500 feet (2,600 and 1,700 m.) the valle or medio yunga; (3) below 5,500 feet (1,700 m.) the yunga, devoted to warm-land crops. Potatoes are grown in the higher elevations, maize throughout but most successfully and of greatest variety at the intermediate heights.

The Peruvian Andes.—The rainy season is the warm season, here called invierno; the dry season is called verano. The puna is dominated by tola heath only near the Bolivian border, elsewhere being mostly bunches of ichu grass and cushions of llareta. North of Cajamarca it gives way to turf-forming jalca grassland, resembling the páramos of Colombia. Agriculture on the puna is limited to the growing of potatoes, quinoa, and oca, though the term "puna" is sometimes restricted to the pasture lands above the limit of agriculture. Cuzco 11,200 feet (1,400 m.)) is about 2 degrees warmer than the Titicaca Basin and has 31 inches (80 cm.) of rain. Around it and down its flanking valleys lies one of the prized agricultural areas of the Andes, passing at a distance of about 100 miles along both the Apurimac and Urubamba Valleys into tropical montaña. The basin of Huanuco is dry, but well watered by streams. North thereof stretches the 300-mile (500-km.) trough of the upper Marañón River, a cactus-covered steppe, deeply dissected and of little agricultural value. More important to settlement have been smaller valleys and gentler slopes at higher elevations, such as those of Huaráz, Cajamarca, and Chachapoyas (8,000 to 10,000 feet) (2,400 to 3,200 m.). An outlying area of aboriginal importance is the savanna of Moyobamba, a dry sandy plateau (around 2,600 feet (800 m.)) surrounded by rain forests of the Marañón and Huallaga Rivers, agriculturally important for cotton and tobacco.

The Andes of Ecuador.—From Cuenca north inter-Andean rainfall lacks the simple contrast between rainy and dry season, and tends to a double maximum and minimum. Northward, also, the bases of the mountains are immersed both on the Pacific as well as the Amazonian side in tropical rain forests, nearly uninhabited, difficult to penetrate, and lacking the climatically and vegetatively transitional valleys of Perú.

The Colombian Andes.—Here three zones were especially important to early habitation: (1) At high levels, around 10,000 feet (3,000 m.), the páramos provide excellent pasture and suitable conditions for potato culture. The páramos of the Cordillera of Bogotá have been of most importance to settlement, but other páramos of the eastern cordillera, extending into Venezuela, were similarly preferred sites of habitation. (2) The high level savanna basin (around 8,000 feet (2,500 m.)) in particular of the eastern cordillera, are important agricultural sites, being largely planted to maize. (3) The low steppe and desert basins of Magdalena and Cauca yield tropical products, in part by irrigation.

The tectonic structure of Colombia gives rise to the greatest diversity of climate; indeed, one finds here almost every climate of South America, excepting those of *Cs* type. In short distances one may pass from tropical rain forest, through tropical savanna, to desert and steppe or to humid temperate uplands. The spreading design of the Andes gives added diversity of exposure and increases the variety of local climates still further, in contrast to the simplicity of Andean structure to the south. In all respects Colombia has the most minutely detailed and contrasted pattern of physical conditions in South America. Considering also the diversity of useful minerals and its superior position with regard to continental communications, it is obvious that nature has marked out here the most advantageous land for cultural development.

HUMID TEMPERATE LANDS OF THE SOUTH

Pampas of La Plata.—Below Santa Fé the Río de la Plata drains a prairie land, as large and as rich as the prairies of the Mississippi Valley and with a much milder climate. The coldest part of the Pampas, the Patagonian border, has mean winter temperatures corresponding to those of Fort Worth, Tex. Midsummer weather averages about the same as Iowa. Rainfall is well distributed throughout the year, and in amount as in our prairie States.

The natural vegetation and its distribution as regards relief and drainage also resembled our prairies. Tall perennial grasses covered the plains; thin bands of woodland (especially mimosas) followed the stream courses. On irregular terrain woods cover was normal. Therefore, hills and breaks were wooded, plains grassy.

The middle Paraná.—The ascent up the Paraná River is by gradual stages into the Tropics; northward the cool season grows less and less marked, rainfall is more and more concentrated on the summer months, and increases in total amount, especially northeastward. Concepción has a tropical climate; Asunción is still mesothermal. The land of the *Guaraní* and of modern concentration of populations is not tropical.

Below Concepción the flood plain of the Paraná River and its tributaries contains large prairies and wet meadows broken by strips of forest (e. g., quebracho) and by groves of palms (*Copernicia cerifera*). East of Asunción, uplands reaching toward the Paraguay River formed a park landscape, a transition land in which floristic elements from the northern savanna, the western Chaco, and the south Brazilian Highland mingled. Here, for instance, is the western limit of thickets of yerba maté (*Ilex paraguayensis*). The climate, lacking extremes of all sorts, is extraordinarily favorable to a great variety of plants, including cultivated forms. The *Guaraní* had the use of an unusually large variety of domesticated plants.

Highlands of Southeast Brazil.—The lowland country of Rio Grande do Sul belongs to the Pampa Prairie; the Serra Geral marks the beginning of forests mixed with grasslands that extend north across the Paraná Plateau. The climate is warm in summer, springlike in winter; with abundant rainfall, heaviest in summer, but not infrequent in winter. Killing frosts occur and even snow falls occasionally. Deciduous forests occupied the valleys; on the upland prairies, forests of *Araucaria* and thickets (of maté) alternate.

In São Paulo and northeast thereof the elevation of the Brazilian Highland is sufficient to introduce a long strip of mesothermal climate that continues north to about lat. 15° S. Here there is marked contrast between summer-rain period and winter dryness. Frosts may occur in winter. The original vegetation is thought to have consisted of deciduous forest (especially on igneous rock) interspersed with grassy plains.

Central Chile.—Toward the southern end of the Atacama Desert the so-called Mediterranean regime of rainfall sets in. Except for the curious coast strip at the northeast of Brazil this is the only part of South America with winter rains and summer drought. Beyond lat. 32° S. the rainfall increases sufficiently to form a humid or at least subhumid climate (*Cs*). Conditions are quite similar to those of the west coast of the United States and of Canada. The march of temperature and rainfall at Valparaiso is almost identical with the coast of Southern California (e. g., San Luis Obispo). Santiago, in the interior valley, is a close counterpart climatically of Los Angeles, though somewhat colder in winter. Valdivia (*Cf*) is like the outer coast of Vancouver Island; the west Patagonian coast reproduces conditions along the coast of Alaska.

Vegetatively the *Csb* climate is still a monte. The schematized change between the largely thorny monte and grasslands of the north and the high latitude "beech-conifer" forest is said to take place on the Río Bíobío in lat. 37° S. Actually, the southern forest extends farthest north in the Andean foothills on the crest of the Coast range and is most retracted in the central longitudinal valley. The north is a land of grass, cactus, and scrub (especially *Acacia*). The interior valley south almost to the Río Bíobío was an open thorny mimosaceous woodland (espinal); the coastal zone was heavier brush with *Puya* and cacti, adding trees southward. The "beech" (*Nothofagus*) forests of the south are diversified as to variety of trees and support many climbers, epiphytes, and a ground cover of lush-growing cane. In the northern part of the forest are two small areas of the *Araucaria imbricata*, the cones of which afforded a significant source of food to the aboriginal population. South of lat. 47° S. the forest becomes notably impoverished in size, variety, and extent, and passes over into tundra growth at the farthest end of the continent.

SUPPLEMENTAL DATA TO ACCOMPANY MAP 10*

(Characteristic plants significant in native economy given for each association cited. The explanation of the symbols for these associations appears on the map.)

I. Humid forests.
  A. Lowland tropical rain forests.
    1. Amazon-Guiana rain forests. Latex-yielding plants: *Hevea* sp., *Castilla ulei*, *Mimusops balata*. Nut-yielding plants: *Bertholletia excelsa* (Brazil nut), *Virola sebifera* (ucuuba nut), etc.
      1a. Amazon *varzea* jungle (alluvial flood plain). Oil-nut and fiber-bearing palms: *Attalea excelsa* (urucury palm), *Astrocaryum tucuma* (tucúm palm), *Euterpe oleracea* (assahy palm), etc. Nut-yielding hardwoods: *Carapa guianensis* (andiroba nut), etc. *Ceiba pentandra* (sumaumeira, or kapok tree).
    2. Colombia-Panamá rain forest. Palms: *Phytelephas macrocarpa* (tagua nut palm), *Carludovica palmata* (toquilla palm), *Oenocarpus* sp., *Elaeis melanococca* (corozo palm), *Bactris* (syn. *Guilielma*) sp. (chontaduro palm). Latex-bearing trees: *Castilla elastica*, *Mimusops balata.*

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*Compiled by Robert West, also author of map 10.

SUPPLEMENTAL DATA TO ACCOMPANY MAP 10—Continued

I. Humid forests—Continued
  A. Lowland tropical rain forests—Continued
    3. Dyewood-palm rain forest of the Caribbean. Dyewoods: *Haematoxylon campechianum* (campeche wood), *Caesalpinia echinata* (brazilwood). Palms: *Attalea cohune* (cohune palm), *Oreodoxa regia* (palma real) in Caribbean Islands. Other plants: *Swietenia macrophylla* (mahogany), *Castilla elastica*, *Ceiba pentandra*, *Cedrela odorata*, *Genipa americana* (jagua).
    4. Brazil coast rain forest. Dyewoods: *Caesalpinia echinata* (brazilwood). Palms: *Astrocaryum tucuma* (tucúm palm), *Attalea indaya* (inday palm), *Euterpe oleracea* (jassara palm), *Cocos coronata* (jeriva palm).
    5. Mixed savanna-rain forest (Northeast South America). Palms: *Mauritia flexuosa* (moriche, miritÍ palm), *Copernicia tectorum*, *Maximiliana regia*. Latex-bearing trees: *Mimusops balata*, *Hevea benthamiansa*. Nut-bearing trees: *Dipteryx odorata* (tongka bean), etc.
  B. Montaña rain forest (e. g., eastern slopes of Andes). Wax-yielding palms: *Ceroxylon andicola* (palma de cera), *Oreodoxa andicola*. Other plants: *Cinchona* sp., *Erythroxylon coca* (coca).
  C. Semideciduous upland forest.
    Brazil. Leguminous trees: *Myrocarpus fastigiatus* (cabreua), *Hymenaea stilbocarpa* (jatoba), *Sweetia elegans* (perobinha), *Couratari* sp. (jequitiba).
    Eastern Bolivia and Northwest Argentina. *Podocarpus* sp. (pino), *Acacia* sp., *Alnus jorullensis* (Alizo).
      C_1. Mixed semideciduous forest-xerophytic scrub.
  D. Middle latitude mixed forests.
    1. Beech-conifer forest (Southern Chile). Beech: *Nothofagus* sp. Conifers: *Fitzroya patagonica*, *Libocedrus chilensis*.
    2. Oak-conifer forest (Highlands of Central America and Caribbean Islands). Oak: *Quercus* sp. Conifers: *Pinus* sp.
    3. Oak Forest (Highlands of Costa Rica and Panamá). *Quercus* sp.
    4. *Araucaria* forests.
      Araucaria imbricata (Southern Andes), *A. brasiliensis* (Southern Brazil).
II. Savanna.
  A. Sapote jungle of southern Yucatán. *Achras sapota* (chicosapote); *Acrocomia vinifera* (coyol palm).
  B. Shrub-palm savanna.
    Llanos of Orinoco Basin. Shrubs: *Bowdichia virgiliodes*, *Curatella americana* (chaparro). Palms: *Mauritia flexuosa* (moriche palm), *Copernicia tectorum* (llanos palm).
    Campos of Central Brazil. Shrubs: *Bowdichia virgiliodes*, *Hancornia* sp. (mangabeira), *Caryocar butyrosum* (piquia), *Anacardium occidentale* (cajú nut), *Acacia* sp.; palms: *Mauritia vinifera* (burití palm), *M. flexuosa* (miritÍ palm).

SUPPLEMENTAL DATA TO ACCOMPANY MAP 10—Continued

II. Savanna—Continued
  B. Shrub-palm savanna—Continued
    Savannas of Central America and Caribbean Islands. Shrubs and trees: *Toluifera pereirae* (bálsamo) in northern Central America, *Parmentiera edulis* (huajilote), *Crescentia* sp. (calabazo), *Mimosa* sp., *Acacia* sp.
      B_1. Palm forests of eastern Maranhão. *Orbignya* sp. (babassú palm), *Euterpe oleracea* (assahy palm).
  C. Guiana Coast swamp savanna. Mangrove swamp: *Avicennia nitida*, *Rhizophora* sp. Palms: *Mauritia flexuosa;* various sedges.
  D. Swamp-palm savanna (Mojos plains; Paraná-Paraguay flood plain). Palms: *Mauritia vinifera* (burití palm), *Copernicia cerifera* (carnauba), *Cocos yatay* (yatay palm), *C. australis* (pindó palm), etc.
  E. Pine-palm savanna (Caribbean area). Palms: *Attalea cohune* (cohune palm), *Sabal* sp. (palmetto), *Oreodoxa regia* (palma real) in Caribbean Islands, *Copernicia* sp. Pine: *Pinus tenuifolia*, *P. occidentale*, *P. cubensis.*

III. Xerophytic scrub.
  A. Caatinga scrub forest (northeast Brazil). Palms: *Mauritia vinifera* (burití palm), *Copernicia cerifera* (carnauba palm). Dye woods: *Caesalpinia echinata* (brazilwood). Balsam: *Bursera* sp. Latex: *Manihot glaziovii* (maniçoba). Nut-bearing plants: *Anacardium occidentale* (acajú nut).
  B. Pod-bearing leguminous scrub forest and scrub steppe.
    1. Scrub steppe (monte). *Prosopis* sp.; species of *Mimosa*, *Acacia*, and *Caesalpinia; Larrea* sp. in more arid areas.
    2. Patagonian scrub steppe and desert. As in (1), but with predominance of *Larrea* and in far south, *Azorella* sp.
    3. Scrub forest of Gran Chaco. *Quebrachia* sp.; leguminous shrubs and trees, as in (1); various palms, as in (II, D).

IV. Prairie grasslands.
  A. Pampa grassland. Grasses: *Stipa* sp., *Cortaderia argentea* (pampa grass). Shrubs: *Prosopis* sp. (algarrobo), *Acacia cavenia*, etc.

V. Alpine.
  A. Puna grassland. Bunch grasses: *Stipa ichu* (ichu grass), *Festuca* sp. Various annual grasses and herbs; shrubs; *Azorella* sp. (llareta).
    A_1. Tola heath puna. *Lepidophyllum quadrangulare* (tola bush).
  B. Paramo grassland. Grasses: (all perennial) *Andropogon* sp.; various shrubs: *Polylepis* sp.
  C. Tundra. Low shrubs, mosses.

VI. Desert.
  A. Coastal desert of Perú and Chile. Practically vegetationless except for cacti (*Cereus*).
  B. Fog vegetation of Perú coast (Lomas vegetation). Predominantly annual grasses and herbs.
  C. Saline (playa) areas.
  D. Ice desert.

FAUNA AND ETHNOZOOLOGY OF SOUTH AMERICA

By Raymond M. Gilmore

INTRODUCTION

PURPOSE AND SCOPE

This paper is written to serve primarily as a zoological guide to anthropologists. It discusses the "South American" (Neotropical) fauna and its relation to aboriginal man through a description of the principal animal groups and species and their general history, ecology, regional distribution, and utilization by man. Geographically, this account covers South America, and Central America as far north as Honduras.

There are many varieties of South American animals, and a large number are archaic endemics. These, and many geologically recent invaders, are considered as peripherally located in relation to late world centers of higher evolution, and therefore as backward or weak, even though some may be highly specialized in one way or another, and a few may have considerable competitive strength, even in direct struggle with animals of more progressive central world areas.

The idea of a scale of evolution and a ranking of animals as progressive or retrogressive, strong or weak competitively, specialized or generalized in structure, function, and behavior, is directly related to the phylogenetic and geologic history of the fauna discussed. The relationship between the evolutionary ranks or positions of animals and ethnozoology is not well understood, but some trends appear to exist. Most of the higher domesticates and semidomesticates are from the higher categories of animal life, but such factors as convenience in size, utility of products or functions, and availability of the animal itself may be as cogent reasons for its domestication as a higher mentality and behavior, adaptability, and ecology favorable to man.

Man utilized this fauna in many ways: for food, hide, fur, thread (sinew), rope, pets, ceremonies, medicine, and for controlled produce and work (domestication and semidomestication). In this exploitation, and indirectly through his presence in numbers and through deforestation concomitant with agriculture and the building of permanent settlements, man influenced adversely the adjacent fauna by reducing the numbers and range of the affected species. On the other hand, man himself was affected and his occupation of some areas retarded by certain animals, particularly by insect pests and animal-borne diseases; and in his exploitation, man may have saved by domestication certain species from extinction, such as the alpaca, and perhaps the llama and cavy (guinea pig), if one believes, as do some authors, these animals to be distinct species not derived from any living wild form. (See discussions of these species.) Though this view is not supported here, except possibly with the alpaca, it appears to be valid as regards other domesticated plants and animals in the world, such as the potato, corn, tobacco, peanuts, and tomatoes in the New World (Cook, 1925, p. 41), and the horse, zebu, dromedary camel, and Père David's deer in the Old World. From the many species of cultivated plants which exist only in the domesticated state in the New World, in comparison with the few animals that can be placed with certainty in this category, it can be concluded that plants were domesticated long before animals in the New World.

Such "conservation" was accidental, and truly conscious conservation did not develop until *Inca* times, when it was practiced on the vicuña (and guanaco), guano bird, and perhaps some other species. Also, as far as known, aboriginal man in Neotropica did not process any animal product except possibly red dye from cochineal insects; i. e., he did not tan hides into leather by chemical means (tannic acid, etc.), prepare perfumes from animal musk or ambergris, or make glue from animal gelatin, or soap from fats.

The following animals, with their uses, were the most important to the aborigines of South America.

DOMESTICATED ANIMALS

Llama (*Lama glama glama*, or *L. glama*): Transport of burdens; meat, wool, hide, medicine, ceremony, sinew, pets.

Alpaca (*Lama pacos*): Wool, meat, ceremony, medicine, hide, sinew, pets.

Cavy, or guinea pig (*Cavia porcellus*, or *C. p. porcellus*): Meat, ceremony, medicine, pets.

Muscovy duck (*Cairina moschata*): Meat (with eggs), pets.

(The dog, *Canis familiaris*, and the turkey, *Meleagris gallopavo*, were not Neotropical endemics, though they were found in South America in aboriginal times as cultural elements diffused from North America.)

SEMIDOMESTICATED ANIMALS

Hunting huron (*Galictis furax*): Pets, hunting chinchillas.

Otter (*Lutra* sp.): Pets; fishing.

Extinct abrocoma (*Abrocoma oblativa*): Ceremony, food (?).

Extinct paca (*Cuniculus thomasi*): Ceremony, food (?).

Rhea (*Rhea americana* and *Pterocnemia pennata*): Food, feathers, pets.

Tree ducks (*Dendrocygna viduata* and *D. bicolor*): Food, pets.

Steamer duck (*Tachyeres pteneres*): Food, pets.

Trumpeter (*Psophia*): Pets, sentinels.

Chachalacas (*Penelope*, *Ortalis*): Food, pets.

Curassows (family Cracidae, several genera): Food, sentinels, pets.

Stone-plover (*Oedicnemus dominicensis*): Pets, sentinels.
Parrots (family Psittacidae, especially genus *Amazonia*): Pets, feathers.
Suckerfish (*Echeneis naucrates*): Capture of turtles, manatee, and fish.

OTHER IMPORTANT ANIMALS

Monkey (family Cebidae, many genera): Food, pets.
Armadillos (especially *Dasypus novemcinctus*): Food.
Extinct ground sloths (several families): Food (?).
Extinct and living capromyid rodents of Antilles: Food, pets (?).
Agouti (*Dasyprocta*, several species): Food.
Capybara (*Hydrochoerus hydrochaeris*): Food, hide.
Paca (*Cuniculus paca*): Food.
Bristle rat (*Proechimys*, and the extinct Antillean *Brotomys* and *Boromys*): Food.
Plains viscacha (*Lagostomus maximus*): Food.
Mountain viscacha (*Lagidium viscacia*): Food, wool.
Mara (*Dolichotis australis*): Food.
Cavies (especially genera *Galea*, *Cavia*, and *Microcavia*): Food.
Tuco-tuco (*Ctenomys*, several species): Food.
Rabbits (*Sylvilagus*, several species): Food.
Sea lion (*Otaria flavescens*): Food, hide.
Fur seal (*Arctocephalus australis*): Food, hide, fur.
Marine otter (*Lutra felina*): Food, fur.
Long-nosed raccoon (*Nasua*): Pets.
Jaguar (*Felis onca*): Sport, hide, ceremony, art.
Puma (*Felis concolor*): Sport, hide, ceremony, art.
Ocelot (*Felis pardalis*): Pets, ceremony (?).
River dolphin (black, *Inia geoffroyi*; pink, *Sotalia pallida*): Food, hide, ceremony, mythology.
Manatee (*Trichechus manatus* and *T. inunguis*): Food, fat (oil), hide.
Tapir (*Tapirus*, *Tapirella*): Food, hide.
Peccary-pig (*Tayassu tajacu* and *T. pecari*): Food, hide, pets.
Deer (*Odocoileus*, *Blastoceros*, *Ozotoceros*, *Hippocamelus*, *Mazama*, *Pudu*): Food, hide, sinew, pets, bone and horn implements.
Guanaco (*Lama glama guanicoe* or *L. guanicoe*): Food, hide, fur, wool, pets, medicine, sinew.
Vicuña (*Lama vicugna* or *Vicugna vicugna*): Food, hide, fur, wool, pets, medicine, sinew.
Tinamou partridges (family Tinamidae): Food.
Guano bird, cormorant (*Phalacrocorax bougainvillii*): Guano, food.
Ducks and geese (order Anseriformes): Food.
Condor (*Vultur gryphus*): Ceremony, art.
Toucans (family Ramphastidae, many genera): Feathers, pets.
River turtle (*Podocnemis*, and chelids): Food.
Iguana (*Iguana*): Food.
Pirarucu (*Arapaima gigas*): Food, implements.
Unarmored catfish (*Platystoma*, etc.): Food.
Dourado (*Salminus*): Food.
Sabalo (*Prochilodus*): Food.
Spiny lobster (*Panulirus*): Food.
Fresh-water shrimp (*Macrobrachium*): Food.
Ants, mosquitoes, and other noxious insects: Pests, vectors of disease.
Razor clam or mussel (*Mytilus*): Food, implements.
Conch (*Strombus*): Food, implements.

DEFINITION OF NEOTROPICAL REGION

South America, with the Caribbean Antilles (West Indies), and Central America (south of the tableland of México) constitute what is called the **Neotropical Region**; it is one of the six major continental zoogeographic regions (or realms) of the world (marine regions not considered here).

The other five of the six regions are as follows: (1) **Nearctica:** North America north of tropical México; (2) **Palearctica:** Asia (except the southeast portion), Europe, and Africa north of the Sahara Desert; (3) **Ethiopia:** Africa south of the Mediterranean strip, and Madagascar; (4) **Orient,** or **India:** Tropical southeast Asia, and Malaysia; and (5) **Australasia:** Australia, New Guinea, New Zealand, and Oceania. The Nearctic and Palearctic regions are often combined as Holarctica because their relationships are obviously closer than usual. (See Lydekker, 1896; Sclater and Sclater, 1899.) Certain students think that Oceania also can be separated validly as an independent area.

Neotropica is not the largest region in size, but it covers the greatest area in latitude (78 degrees) and has the highest percentage and greatest number of unique, or endemic, forms. This amazing amount of endemism, coupled with general richness of fauna, is due to a combination of (1) large area, (2) diverse environment, (3) long isolation (of South America proper) as a continental island during most of the Tertiary geologic epoch, (4) a good stock of animals before isolation, and (5) a position peripheral to the Holarctic land mass.

South America proper (omitting the Central America subregion) covers 6,825,876 square miles (equals two-thirds of North America with Central America, one-third of Eurasia, five-eighths of Africa, 2⅓ times Australia), an area large enough for diverse biological development. South America has the highest mountains and the highest extensive habitable areas, the most absolute deserts, and the most tropical rain forests of the Western Hemisphere, and many other environments permitting biologic diversity. South America was isolated from North America as a continental island from the time of the Eocene (basal Tertiary) until about the middle Pliocene; thus allowing the time factor in biologic development to work well toward end points of adaptive (radiative) evolution. Before Eocene isolation, South America undoubtedly had a diverse fauna, and this, in isolation for a long time, evolved into many distinct lines of morphology. Lastly, South America occupies a peripheral position to the Holarctic land mass and is thus the home of many relict forms. At the start of isolation in the Eocene, the fauna consisted of endemics and intruders, and these could be conceived as evolutionarily semistatic; but under the influence of the isolation, some were sufficiently plastic to produce many new lines of phylogeny, or were able to persist and to continue to evolve in the absence of invasion of "higher" forms from other regions.

All these factors give South America (Neotropica proper) its uniquely high position among zoogeographic regions as concerns richness and endemism of fauna (and also flora).

Neotropica, in addition, has a large number of relatively recent (post-Contact, late Pliocene through Recent) invader forms from North America, and its fauna today is characterized by this mixture of old endemic with recent invader endemic and pure intrusive forms. Man and other dominant northern animals are post-Pliocene invaders.

GENERAL FAUNA OF NEOTROPICA

On first acquaintance most of the Neotropical animals seem strange, and some actually bizarre. The following list will give some idea of the many forms that the visitor from another region may encounter.

Mammals.—Marsupial opossums; many strange bats, including the leaf-nosed species and the true blood-sucking vampire; marmosets and prehensile-tailed and other related monkeys; the anomalous sloths, armadillos, and truly edentulous placental anteaters; many rodents, some large, including cavies, capybaras, agoutis, pacas, chinchillas, viscachas, maras, etc.; the long-nosed raccoon, and kinkajous; cats of various types, including pumas, jaguars, and many spotted and unspotted smaller species; many mustelids, including a giant river otter, and irara and hurons; a bear; foxes, and an aberrant bush dog; deer and peccary pigs, llamas, alpacas, guanacos, and vicuñas; tapirs, manatees, and river dolphins.

Birds.—The rhea; tinamou quails, and partridges; boat-billed herons, jabiru storks, and trumpeters; the screamers, and Muscovy and other ducks and geese; pigeons and doves; condors, buzzards, and hawks; curassows and chachalacas; hoatzins, wood-rails, sun-bitterns, seriemas, oilbirds, toucans, cotingas, wood hewers, hummingbirds, macaws, and many parrots and parakeets; as well as antbirds, swallows, orioles, blackbirds, oropéndolas, tanagers, thrushes, sparrows, and finches; etc.

Reptiles.—Crocodiles and caymans; the matamata and other river turtles; tortoises; iguanas and other large lizards; boas and anacondas; poisonous fer-de-lances and the giant bushmaster; etc.

Amphibians.—Burrowing wormlike caecilians; marsupial and viviparous frogs; horned frogs and poisonous toads, etc.

Fishes.—The lungfish; an amazing array of large and small catfish, both armored and unarmored; electric and mud eels, and the fresh-water sting ray; giant "pirarucu"; carnivorous fishes; the salmonlike "dourado," and many midget fish-bowl beauties; etc.

Other animals.—Myriads of insects, including biting flies and mosquitoes; huge wasps and tiny stingless bees; fire ants, army ants, leaf-cutting ants, giant solitary ants, and ground and tree termite "ants"; lanternflies; huge forest moths and brilliant morpho butterflies; ticks and red bugs; giant bird spiders; centipedes, huge land snails, and the strange many-legged *Peripatus*, etc.

HISTORY OF NEOTROPICAL FAUNA

The Neotropical fauna has a unique geologic history, which is responsible for its present constitution. The following geologic scale is used, in order of older to younger:

Mesozoic Era	Secondary
Cenozoic Era	
Paleocene Epoch	Tertiary
Eocene Epoch	
Oligocene Epoch	
Miocene Epoch	
Pliocene Epoch	
Pleistocene Epoch	Quaternary
Recent (Holocene) Epoch	

Early Mesozoic contact period.—In the late Mesozoic and basal Tertiary (Paleocene), South America was connected with some other continent, almost certainly North America. During these millions of years, the fauna of South America was partially the same as that of the connecting continent. The basic Tertiary vertebrate fauna included marsupial, chiropteran (bat), primate, edentate, rodent, and ungulate stock among mammals; and *Pleurodira* and *Testudo* (?) turtles and *Caiman* crocodiles among reptiles; also many more nonfossil groups.

Tertiary isolation period.—During the Eocene, Oligocene, Miocene, and basal half of the Pliocene, South America was a continental island (Central America, as it existed, was a part of North America).

From the basic faunal stock arose the present primary endemics, and also many others now extinct. Of the latter, those represented by fossils were mostly mammals, and included the carnivorous boryhaenid and rodentlike polydolopid marsupials and typothores, ground sloths, glyptodont armadillos, horselike proterotheres and notohippids, camellike macraucheniids, hippolike toxodonts, tusked astropotheres, mastodonlike pyrotheres, clawed herbivorous entelonychians (homalodotheres), etc. Many of these were distinct and in morphology were "outrageously absurd" (Scott, 1937, p. 518), and all were confined to South America. No anthropoid, humanoid, true carnivore, murid, proboscidean, true equid, cervid, or bovid stocks developed in South America (these are of Old World or Nearctic origin). All the types—those specialized and later to become extinct, and those specialized or generalized and surviving today—swarmed over South America, and for the aeons of its continental-island existence filled the many ecologic niches. (See Scott, 1937; Rusconi, 1933.)

Mid-Pliocene to Recent contact period.—In the mid-Pliocene, land contact occurred with Central and North America, and persisted to date, perhaps with some short intervals of disconnection. (See Matthew, 1939; Simpson, 1940 a, p. 157, 1940 b, and 1943, p. 416; and Scott, 1937, p. 121.)

Immediately after this continental contact a great interchange of animals began and has continued to date, though more northern animals went to South America than vice versa because (1) the northern animals were more efficiently specialized along many similar lines of adaptive morphology and were better competitors, and (2) Central America was a southern fringe of Nearctica and was inhabited by tropical evolutes of the higher northern stock (as well as by some relict peripheral stock). To South America from the Tertiary Nearctic Central America went the already semitropically adapted Nearctic Pliocene forms of bats, cricetid rodents, rabbits, cats, wolves, foxes, mustelids, bears, deer, tapirs, true horses, peccaries, camelids, mammoths, and mastodons, as well as some birds and other animals. This invasion continued through Pleistocene and Recent times, and man was one of the later invaders (late Pleistocene or early Recent). The fate of the northern invaders was good; they penetrated far, and most survived, except the horses, wolves, saber-tooth tigers, mammoths, mastodons, and most of the bears. No Nearctic bovids (cattle, bison, buffalo, sheep, goats, etc.), however, penetrated to South America, probably because none was a semitropical adaptive inhabiting Nearctic Pliocene Central America; but all apparently were inhabitants of plains and mountains of higher latitudes and were rather far removed from the bridge area.

Conversely, from south to north, especially into the tropical and subtropical zones of Central America and southern Recent Nearctica, went some opossums, bats, monkeys, ground and tree sloths, glyptodonts and other armadillos, anteaters, hystricoid rodents, hummingbirds, parrots, etc., but no unique Neotropical ungulate stock, which already had died out or which was confined to the plains of southern (temperate) South America. In the favorable zones of Central America and southern México, the numerous Neotropical invaders competed well and survived to give the present Central American subregion its Neotropical character. Farther north in North America, where some forms penetrated (especially the ground sloths and glyptodonts) few survived. Of mammals, only the porcupine, opossum, and nine-banded armadillo remain today (the collared peccary may be a relict from a more widely distributed North American Pleistocene stock, and the originally Nearctic ocelot, jaguar, and long-nosed raccoon may be reverse fringe invaders). If the Cenozoic intercontinental separation had existed in southern Nearctica, and if pre-Pliocene Neotropica had possessed a northern semitemperate fringe, especially with plains ecology, the number of Neotropical forms penetrating Nearctica would have been vastly larger.

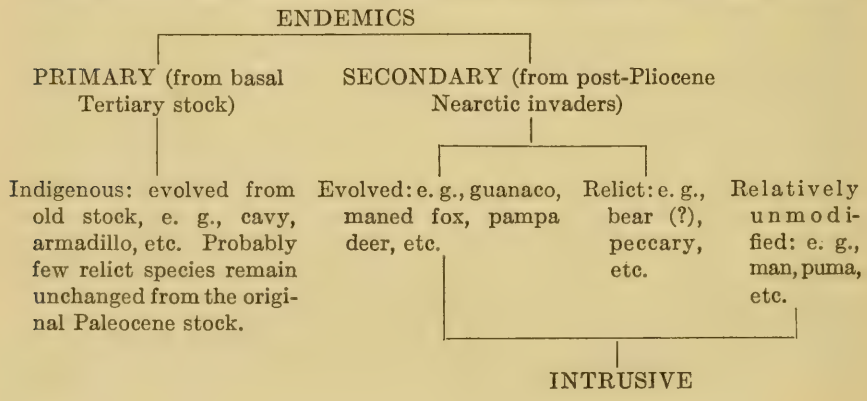
This contact between South and North America was an important event in Neotropical faunal history, because the "age of mammals" was at its peak; that is, mammals were numerous and many were extremely specialized (man was one), and the periphery of each continent was invaded by the dominant members of all types on the adjacent periphery of the other.

It must be noted, however, that Central America was narrow, and (1) the progress of invaders was a slow infiltration rather than a rapid mass invasion, (2) only those species crossed which were tropical adaptives of adjacent peripheral portions of North and South America, and (3) exclusive members of the temperate portions of both continents lived away from the land bridge and did not make the crossing. This latter point was abrogated somewhat by equatorially shifting isotherms during Pleistocene glaciations accompanied by equatorially moving species. Prehistoric man entered South America over this narrow Central American route. This migration was slow, whether man inhabited the New World during or after the last glaciation. His total extension of range from Bering Strait to Cape Horn must have taken several millennia at least.

Northern forms today are replacing Neotropical endemics, pushing them into small peripheral or centrally isolated habitats of extreme conditions; the White man's replacement of the aborigines has been extremely rapid and is still continuing.

The spread of species in "new" territory, previously accessible or inaccessible, has not been studied extensively; certainly, reversals and oscillations are common in range extension over long periods and great distances. Such reversals may be caused by extremes of climate of temporary nature (droughts, floods, cold spells, etc.), dynamic geologic catastrophes (volcanic eruptions, lava flows, etc.), and biologic factors (disease, strong competition from a newly encountered competitor, loss or change of vegetation, etc.). All these points should be weighed in any consideration of intercontinental movement of North and South American organic forms.

The Neotropical fauna can be divided into historic types as follows:



ENDEMICS

PRIMARY (from basal Tertiary stock)

Indigenous: evolved from old stock, e. g., cavy, armadillo, etc. Probably few relict species remain unchanged from the original Paleocene stock.

SECONDARY (from post-Pliocene Nearctic invaders)

Evolved: e. g., guanaco, maned fox, pampa deer, etc.

Relict: e. g., bear (?), peccary, etc.

Relatively unmodified: e. g., man, puma, etc.

INTRUSIVE

Many of the endemic species, and most of the endemic genera and families, are primary endemics, i. e., are Neotropical throughout their geologic history, and are descendants of those types which were isolated in South America in the early Tertiary. Other endemics, mostly in the lower levels of genera and species, are secondary endemic and descendants of invader (intrusive) forms from North America in post-contact (post-Pliocene) times. These secondary endemics are the result of modification subsequent to invasion, or of subsequent extinction of related stocks in North America, i. e., they are relicts.

If one considers the higher taxonomic levels, such as families and even orders, the distinction between primary and secondary endemics is quickly apparent. All Bradypodidae (tree sloths), Dasypodidae (armadillos), and Myrmecophagidae (anteaters) are primary endemics, as are also the Callitrichidae (marmosets), Cebidae (monkeys), Histricomorpha (histricomorph rodents), etc. However, all Felidae (cats), Canidae (dogs and foxes), Mustelidae (mustelids, weasellike animals)—in fact, the whole order Carnivora in Neotropica—and Cricetidae (cricetid rodents) are intrusive, though many have become secondary endemics subsequently. The camelid alpaca, guanaco, and vicuña likewise were originally intrusive. Relatively unmodified invaders are not numerous; the puma and man are two.

Some of the primary endemic stocks have relatives in Africa and Australia, and this fact has prompted some authors to postulate late continental drift, or land bridges across the Atlantic or the Pacific Ocean. The faunal history of South America before the Tertiary is obscure, but the Tertiary history is clearer and is best explained by the theory of Matthew (1915, republished in 1939) of the evolution of the higher forms, including man, in Holarctica, and their penetration at opportune times (when land connections existed) to peripheral continents where they suppressed less dominant forms, and where they remained and became relatively primitive in their turn by the extinction, or the emergent evolution of related populations in the central Holarctic areas of their origin. Such a sequence of events is known to have occurred when South America was united to North America via Central America in Mid-Pliocene times.

ECOLOGIC AND ZOOGEOGRAPHIC DIVISIONS OF NEOTROPICA

Ecologic divisions.—Broadly speaking, Neotropica has tropical and temperate climates and ecologic formations (the Andean summits are boreal). The tropical portion greatly exceeds the temperate; the Amazon drainage alone comprises 2,000,000 square miles. This is important because it is not in tropical Neotropica, but in the temperate regions that man developed his highest cultures with a complex ethnozoology; and in Neotropica the temperate area is limited to the relatively narrow southern portion of South America.

(1) Tropical ecologic formations are (sensu lato) the rain forest, dry forest, infertile plain, river (fluviatile), and marine shore. Most are correlated with a monotonous warm temperature and high rainfall, which are considered enervating to man and to other temperate mammals.

The rain forest is the most typical aspect of tropical ecology, and, as elsewhere in the world, shows biologic nature in some of its most riotous and overwhelming manifestations. Literally hundreds of species of plants and animals, both similar and greatly different, are found within a short radius, though generally individuals of each kind are relatively scarce, and fewer species are utilized by man than might be expected. Man's ethnobotany is better developed than his ethnozoology. Animals are spotty in distribution and often in many places in the depths of the rain forest they seem to be entirely absent, though careful search will disclose many small forms. Invertebrates seem to be the dominant form of animal life, and mammals seem not to be numerous as regards either species or individuals. Decay is rapid, and food preservation is difficult. Nature where disturbed reestablishes itself rapidly, and offers strong competition to man, whose cultural advancement involves permanent interference and permanent modification of nature. Fishes are one of the most important forms of animal life for man.

There is no parallel in Neotropica to the tropical southeastern Asian culture-complex of water buffalo-pig-chicken-rice. These species are present today but are post-Columbian introductions and do not form a special culture complex.

The river (fluviatile) aspect of tropical ecology is also characteristic, and in the rainy season it extends its boundaries far over floodable lowlands. Aquatic and arboreal animals are common, and terrestrial forms are found adjacent on the margins; occasionally some species (turtles) occur in surprising concentrations of number; manatees and fishes are important also. Transportation by boat is efficient, and man has found the river environment best suited to his success in the lowland Tropics in relation to other associations.

Plains (grasslands), large and small, are present in tropical Neotropica, but these are generally swampy in the rainy season and relatively infertile. In recent times these plains have not produced a complex fauna of easily utilized and numerous individuals of a few species, such as have the more fertile plains of North America and Africa. If such a fauna existed in the past on the tropical plains of Neotropica, it has become extinct.

The ecology of tropical marine shores is complex where rivers deposit nutrient-rich silt and waters into relatively quiet bays, or where deep, cold nutrient-bearing ocean water wells up near the coast. Mangrove swamps are also abundant in animal life. Pure sand beaches and surf-pounded rocky shores have the poorest faunas. Man probably was governed by ease of exploitation in utilizing shore faunas, and probably preferred in tropical waters the sheltered bays near river mouths rather than the mangrove swamps, sandy beaches, or rocky shores. Shellfish and crustaceans would be used more by man than fishes. Islands with coral reefs are, however, richer in fish than in mollusks.

Tropical mountain ecology, like certain marine formations, is well suited to man, but is of small area in Neotropica. Along the northern Andes and on the Guiana Highlands the tropical mountain conditions approach those of the temperate zone, though seasonal changes are less marked.

(2) Ecologic formations of temperate Neotropica lie mostly in the south, and include plain, steppe, and mountain, with some desert and boreal parts, but there are relatively few strictly desert or boreal species because these parts are comparatively small and are stocked from the fauna of the other larger biotas. However, the desert and boreal steppes were important in the ecology of man because, when met adaptively, they usually offered oasislike conditions for concentrated populations.

The steppes and plains of southern temperate Neotropica hold a typical plains fauna, including camelid species, maras, plains viscachas, armadillos, tuco-tucos, rheas, certain tinamou partridges, upland shorebirds, etc. This present-day fauna is only a remnant of a far richer Pleistocene fauna, which included also horses, toxodonts, glyptodonts, ground sloths, bears, wolves, elklike deer, etc. Such a fauna is comparable, though on a smaller scale, with the bison-antelope-elk-wolf-hare-prairie squirrel-prairie chicken fauna of the North American Great Plains, and it is similarly comparable with the antelope-zebra-wildebeest-hartebeest-lion-dog-ostrich-guinea fowl, etc. fauna of the eastern and southern plateaus and plains of Africa, which, of the known Recent plains faunas, is the richest in large animals.

In temperate Neotropica, man is an important faunal element and may have been so in late Pleistocene times also; certainly he was a strong contemporaneous competitor with a number of now-extinct mammals. Mongolian man, like Caucasian man, probably is an organism of temperate ecology and climate; apparently he finds these conditions most agreeable and responds with high physical and mental activity. The cold and dry climates of the temperate region are favorable for food preservation which is an important factor in permanent human habitation and in the development of animal husbandry and agriculture.

In the extreme southern part of temperate Neotropica, man built around the plains fauna, particularly the guanaco and rhea, an ethnozoologic culture without domestication which is comparable to the bison-antelope culture of the Plains Indian or to the caribou-elk culture of the north woods and tundra Indians, both of North America. In the northern and altitudinally higher parts of temperate Neotropica (Perú, Bolivia, Northwest Argentina, North Chile), man built around the llama, alpaca, cavy, and Muscovy duck a culture with domestication which was far more complex than the comparable yak-horse-Bactrian camel culture of high central Asia. In the mentioned altiplano area of South America ethnobotany was highly developed also, and cultivated plants were numerous, e. g., maize, potato, bean, squash, quinoa, tobacco, and coca. Here human culture culminated in the remarkable *Inca* Empire.

This northern steppe-mountain extension of southern temperate Neotropica deserves special consideration. It was the home of the highest human culture and the greatest development of domesticated animals and cultivated plants in Neotropica. It is a region of rapid transition between boreal, temperate, and tropical formations; between cold and dry, and warm and humid climates. It has tundra, steppe, mountain, temperate forest, tropical forest, and desert. Finally, the greatest regional concentration in Neotropica of different plant and animal species appears to be found in this region, especially on the eastern slopes and foothills of the Peruvian Andes. Such a phenomenon may be the result of quick transitions due to altitude, coupled with deep and isolated river valleys in an extremely rugged terrain. An apparently similar area of transitional zones exists in southwestern Asia (Iranian-Mesopotamian area), where the highest of known domesticated animal-cultivated plant complexes was developed: horse, camel, cattle, pig, goat, sheep, wheat, barley, rye, sorghum, etc. The *Maya-Nahua-Aztec* cultures probably developed also in an area of similar transition; that is, between southern steppe Nearctic and northern tropical Neotropica.

With the high human cultural development of these transitional regions may be correlated two phenomena: (1) Marked climatic change in the past 10,000 years or so, and (2) extinction of most of the parent species of the present domesticated animals and cultivated plants.

The ecology of temperate marine shores is complex and the fauna is rich, especially in sheltered areas near the outlets of streams or where deep cold waters well up near the coast. River and deep ocean waters are rich in dissolved nutrient-salts (nitrates, phosphates, and silicates).

The extreme southern and southwestern shores of South America are favored by fertile waters and deep embayments where littoral life flourishes. Accompanying the aquatic life is a rich fauna of vertebrates (fishes, birds, and mammals), all of which were easily and extensively utilized by aboriginal man.

The ethnozoology of the middle Andean region, which includes areas of transition between temperate and tropical formations, is in itself a large subject, and for this reason is not given special treatment. Its scope can be judged by the following list of animal representations (incised figures, zoomorphic pots) made from a personal cursory examination of pre-*Inca* and *Inca* pottery in the museums at Lima and Chiclín, Perú:

Mammals: Opossum (?), bat (but none of tropical leaf-nosed varieties), howler monkey, cebus monkey, spider monkey, other monkeys (?), nine-banded armadillo, rat (eating corn), mice, spotted cat (common and obviously kept as pet), jaguar (?), puma, black cat (black jaguar or small jaguarondi), dog, fox, deer (white-tailed), fur seal, sea lion, llama, alpaca, dolphin. *Birds:* Raptorial bird (one with snake in claws and another holding a spotted sharklike fish), "spotted" owl, "barred" owl, speckled shorebirds and partridge (incised speckling or barring may be merely a method of showing feathers), macaw, toucan, crested hawk, condor (many, one eating a child), wild pigeon or dove, Muscovy duck, boat-billed heron, crested duck or goose, kingfisher or hummingbird, casque-billed curassow, razor-billed curassow, booby, pelican, flamingo, and some flying birds with long bills. *Reptiles:* Spotted snake, lizards including striped ones, snakes, turtles, and tortoises. *Amphibians:* Frogs and toads, some spotted, and eared (stylized). *Fishes:* Various, including spotted shark and sting ray. *Invertebrates:* Grasshopper, spiders, ants, fresh-water shrimp, lobster, crab, scorpion, octopus or squid (these may refer to the starfish because of five, six, or seven arms, though the arms are curled at the tips), conch, clam, fresh-water snail. (See also Schmidt, M., 1929 b.)

Additional data which indicate the complex ethnozoology of the *Inca* region are found in the following quotations from Garcilaso de la Vega (Markham's ed., 1869, vol. 2). These apply to gift animals, zoologic parks, totemic and deity animals, etc.

> . . . on the principal festivals of the year, especially on the greatest of all in honour of the Sun, called Raymi [p. 22] . . . the Curacas presented to the Yncas many wild animals, such as tigers, lions, bears, monkeys, cats, macaws, vultures and the birds they call condors. They also presented large and small serpents, . . . [and] great toads and lizards. The Curacas from the sea-coast presented seals and alligators [p. 23].
>
> There was some recollection left of the districts [of Cuzco] where these animals were kept, when I departed from Cuzco. . . . [There was the] district of Amaru, which means a very large kind of serpent. The parts where they kept the lions, tigers, and bears was called *Puma-curcu* and *Puma-chipana*, [from] the name of lion [which] they called *puma* [p. 30].
>
> The birds, that they might breed more conveniently, were kept outside the city. Hence, an estate about a league to the south of Cuzco, is called *Suri-hualla*, or "the plain of ostriches" [p. 31].

> The fierce animals, such as tigers, lions, serpents, toads, and lizards (besides those set apart for the splendour of the court) were kept to punish criminals . . . [p. 31].
>
> [At the festival of Raymi, some Indians] came in a costume neither more nor less than that in which Hercules is painted, wrapped in the skins of lions, with the heads fixed over their own. These were the Indians who claimed descent from a lion. Others came attired in the fashion that they paint angels, with [the] great wing of the bird called *Cuntor* [condor]. . . . These are the Indians who declare that they are descended from a *Cuntor* [p. 160].
>
> [Gold figurines of animals were offered] in the form of sheep [llamas], lambs, lizards, toads, serpents, foxes, tigers, lions, and many sorts of birds [p. 160].

The province of Pumallacta was the village of the puma, which was worshiped by the people as a god (op. cit., p. 341). Near Sullano, the people worshiped pumas and tigers to whom they sacrificed human hearts and blood (op. cit., p. 425). At Chayapoyas, east of Cajamarca, the people worshiped the condor as their chief god, and also snakes (op. cit., p. 278). In the mountains east of Lima, the inhabitants of Xauxa (Sausa) worshiped dogs (op. cit., p. 279).

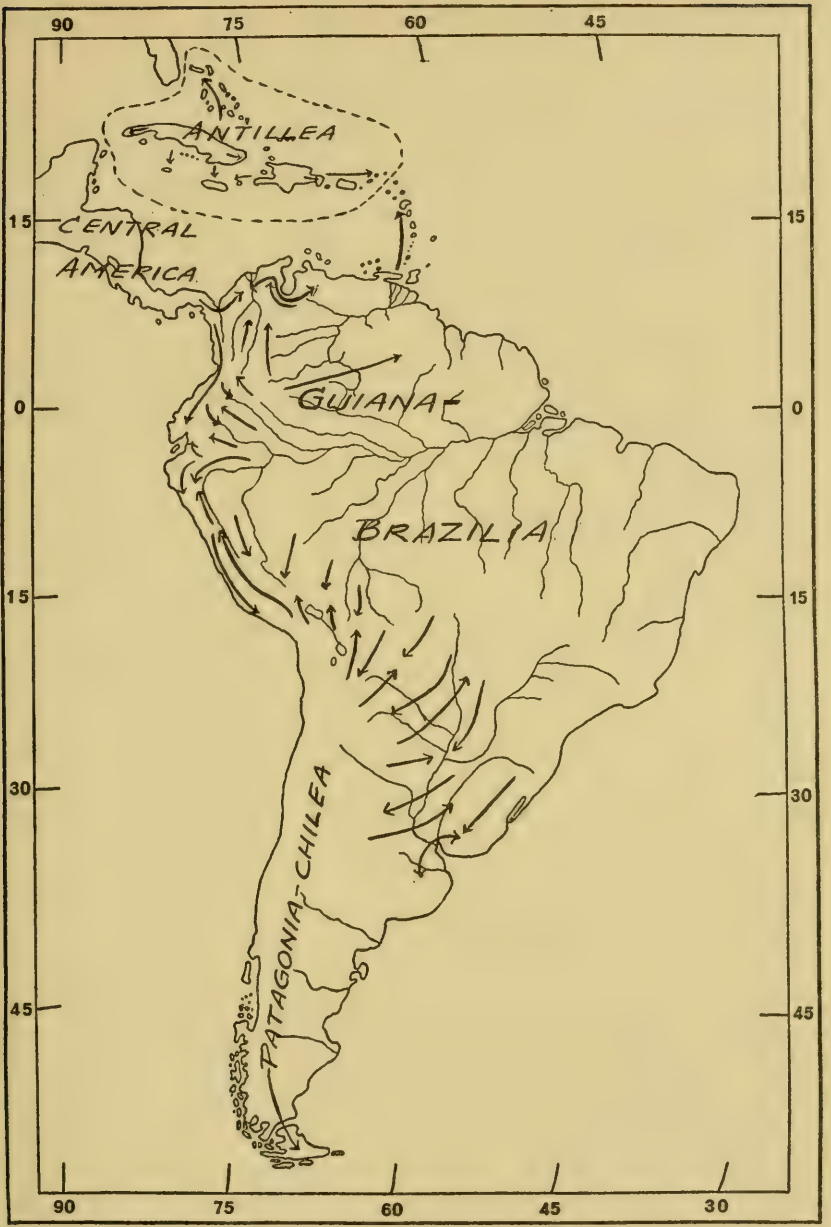
Such special features of mid-Andean ethnozoology as the conservation and utilization of guano birds, the immense drive-hunts (chacus), and the feline and serpent motifs in art, as well as many other details, are treated in the following pages under the species concerned.

Zoogeographic divisions.—Zoogeography, ecology, and ethnozoology are closely interrelated. Zoogeographic areas of various degrees of exclusiveness are characterized by an assemblage of animals which is different from that of an adjacent area. There are several zoogeographic divisions of the tropical portion of Neotropica because of different geologic histories. The temperate portion is a single zoogeographic subregion. This systematization allows for a good understanding of the Neotropical fauna.

Four main subregions may be considered in Neotropica. (See map 11.) For a summary of the interpretations of different authors on Neotropical zoogeography, which superficially show much disagreement, see Lane (1943), Lydekker (1896, pp. 135 ff.), and Sclater and Sclater (1899, pl. 3). The differences shown by these authors in the number and extent of subregions probably result from the use of either large or small taxonomic divisions as a basis of regional differentiation.

(1) Guiana-Brazilia. South American tropical forest-river ecologic formations.
(2) Central America. Central American tropical forest-river ecologic formations.
(3) Antillea. Greater Antillean insular tropical forest-marine ecologic formations.
(4) Patagonia-Chilea. South American temperate-boreal steppe-mountain ecologic formations.

The Patagonia-Chilea subregion is the most distinctive, and may


90
75
60
45
ANTILLEA
CENTRAL AMERICA
GUIANA
BRAZILIA
PATAGONIA-CHILEA
15
0
15
30
45
90
75
60
45
30

Map 11.—Zoogeographic subregions of Neotropica.

legitimately be considered coordinate with a combination of the other three subregions (as was indicated under ecology). Guiana-Brazilia is the typical Neotropical tropical subregion, and has two outlying tropical subregions: Antillea, where conditions of continued insular isolation have resulted in remarkable faunal distinctness; and Central America, which is really a mingling ground between Nearctica and Neotropica, but its flora and climate and most of its faunal elements are tropical (Neotropical), and it is considered a subregion of the latter. Transitional areas between subregions are considered by some as subregions, but are better treated as smaller subdivisions of equal rank with other subdivisions of the larger subregions.

The climate, vegetation, and geomorphology of these regions are discussed elsewhere in this volume (pp. 319–344), and the main types are shown on maps 8, 9, and 10.

Guiana-Brazilia subregion.—This includes all of tropical continental South America (excluding the extreme northwest coastal strip of Colombia and Ecuador) and the Lesser Antilles. The indistinct southern periphery extends from the high Andes of northern Perú and southern Ecuador south on the east side diagonally to the La Plata River region, and on the west side of the Andes, south to southern Perú. Thus the southwestern boundary surrounds a northern fingerlike extension of the Patagonia-Chilea subregion in the central Andes.

The fauna is diverse; it is characterized by most of the didelphid opossums and bats, most of the monkeys, marmosets, anteaters, sloths, armadillos, rabbits, squirrels, typical hystricomorph rodents (spiny rats, bristle rats, agoutis, pacas, capybaras, and *Cavia* guinea pigs, etc.); the raccoon, kinkajou, tayra, ocelot, jaguarondi, and jaguar, maned fox, bush dog, spectacled bear, river dolphin, tapir, manatee, small brocket deer, huge swamp deer, peccary, etc. Most of the rich Neotropical bird fauna is found here, including the chachalacas, curassows, trumpeters, parrots, macaws, toucans, tinamous, etc.; also most of the rich reptile, amphibian, and fish life, including the famous abundant river turtles. This is also the subregion of unbelievably abundant insect life and of tropical disease—faunal factors which make habitation by man so difficult in places at certain times. (See Mello Leitão, 1937.) Domesticated animals are largely absent; even the cavy, dog, and Muscovy duck are not universally distributed in this subregion.

Central America subregion.—This comprises all of Central America south of the tableland of south México, and also the narrow rain forest coastal strip of western Colombia and Ecuador.

Climatically and geomorphologically it is similar to Guiana-Brazilia, and vegetationally it has similar associations but with many different species and even genera. Likewise with the fauna: the stocks are similar, but most of the species and some of the genera are distinct. In addition, it is a transition zone between North and South America and has a number of endemic forms of Nearctic animals and plants. Its local endemism in the smaller taxonomic units of predominantly Neotropical origin and its tropical climate give it subregional rank in Neotropica.

Antillea subregion.—This comprises the Greater Antilles and Bahama Islands (excluded are the Lesser Antilles and the islands lying on the continental South American Caribbean shelf, such as Trinidad, Margarita, Tortuga, and Aruba).

The fauna is an aberrant derivative of the Guiana-Brazilia and Central America subregions, with some Nearctic elements, and it is characterized today by its poverty and high endemicity (distinctness). Most of the species, many of the genera, and even some of the families are unique. The most important types are certain bats, ground and arboreal rodents of the family Capromyidae, the *Solenodon* insectivores, certain very specialized birds, large ground lizards, local marine fish, and land and water mollusks. Moreover, in the Pleistocene and Recent, many other types existed which were similarly endemic, and these included the megalochnid ground sloths, additional capromyid rodents, as well as some large dinomyid and heptaxodontid rodents, nesophontid insectivores, certain bats, the giant barn owl and a macaw of Hispaniola, and a quail-dove of Puerto Rico. All of these types had representatives living up to late pre-Columbian times, and some as late as the occupation by Whites. Their extinction was undoubtedly accelerated by primitive man through agriculture and hunting (especially effective in insular restricted areas), and by the White man through both these factors and the accidental introduction of the house rat and the intentional introduction of the Burmese mongoose. In certain middens, skeletal remains of the extinct types are common. (See Allen, G. M., 1942.)

This extinct fauna, plus the living endemic types (few are mammals), contained relatively few species, but was rich enough in individuals (there were no carnivorous mammals except insectivores) to have afforded man an abundant supply of food, perhaps sufficient, with marine species such as conch, clam, crab, lobster, fish, and turtle, to support his existence without agriculture if necessary. The islands, in climate and natural food, were favorable for human settlement. Access for man and animals was easiest on the southeast through the Lesser Antilles from the adjacent northern shore of South America. Some large water gaps blocked most of the animals, but man easily crossed these by boat.

In the Antillea subregion were two domesticated animals, namely, the Muscovy duck and the cavy (guinea pig, *Cavia porcellus;* see Oviedo y Valdés, 1851, 1: 390); but these species undoubtedly were brought from neighboring northern South America or Central America by the *Arawak.* There was an autochthonous culture trait involving the use of the suckerfish ("pegador," *Echeneis naucrates*) for fishing and for the capture of manatee and turtle, but this animal cannot be considered truly domesticated.

The origin of the Greater Antillea fauna is shrouded in mystery; it has been suggested that a land connection existed between the Lesser Antilles and northern South America, or between Cuba and Jamaica and Central America, or between Cuba and Florida. Conversely, land connection has been denied, and only chance dispersal for lucky waifs held logical. Neither theory explains satisfactorily all the zoogeographical problems. (See Barbour, 1914; Anthony, 1925–26, pp. 194–223; Darlington, 1938; Myers, 1938; Matthew, 1939; and many others.)

Patagonia-Chilea subregion.—This comprises the southern temperate and antarctic sections of South America with a long tongue of the high Andes to northern Perú.

The characteristic fauna includes some aberrant didelphid and caenolestid opossums, and some distinct armadillos; many specialized hystricomorph rodents, such as chinchillas, viscachas, maras (harelike), chinchilline rats, octodon rats, and tuco-tucos (gopherlike), most of the wild cavies (except *Cavia*), mole rats, etc.; huemal deer, the camelid llama, alpaca, guanaco, and vicuña; rheas, some tinamous, many ducks and geese, condors, etc. Insect life is relatively little varied and not abundant, but a few haematophagous species are severe pests. The fauna is as distinct as, though less rich than, that of the Guiana-Brazilia and Central America subregions together, and far richer than the equally distinct Antillea fauna.

The combination of fauna, flora, and climate (temperate steppe-pampa-desert-mountain ecology), as in similar places elsewhere, seems to have been conducive to human cultural advancement. In the southern extremes of the area, man built a culture around the guanaco and rhea, supplemented on the coast by marine species. In the northern part of the area, at medium to high altitudes, and where transition from boreal to tropical conditions was sharp, man built a highly complex culture around the domesticated llama, alpaca, cavy, Muscovy duck, and cultivated plants. In the eastern part, on the vast humid grassy pampas, mammal species were few (Hudson, 1892). Patagonia-Chilea is the most important subregion ethnozoologically.

FAUNA OF NEOTROPICA

GENERAL

There follows a classified discussion of the main animal groups found in Neotropica. A finer degree of classification is used with mammals, because they are the types most frequently and most thoroughly utilized by man and the best-known to the writer and most readers. Some birds, fishes, crustaceans, and mollusks are also important, and many middens along the southern and Antillean coasts are filled with the hard remains of the latter three groups. However, this does not indicate a natural unimportance for still other groups—particularly insects, whose pest importance may be so great that whole regions are rendered almost completely uninhabitable at certain seasons. In fact, were some of these pestiferous insects larger or more numerous, neither man nor beast could survive their blindly instinctive, overwhelming aggression (or defense). Mosquitoes, ants, biting flies of sundry sorts, wasps, ticks, mites, and their accursed ilk are found in the Tropics of South and Central America in an abundance which is at first wonderfully amazing, but soon afterward superlatively vexatious. Diseases through protozoal, bacterial, or viral agents are there also, and though the exact amount of pre-Columbian human and animal disease is not known (especially as concerns the modern scourges of yellow fever, malaria, syphilis, and dysentery), there probably were enough diseases, such as verruga, cutaneous leishmaniasis ("uta," "espundia"), etc., to be factors of prime importance in limiting the distribution and very existence of man and some animals in certain areas. The verruga belt on the western slope of the Peruvian Andes may have had a powerful effect in isolating Highland from Coastal cultures at certain times and in certain places. Some of the swift-flowing streams of the east Andean foothill region along most of its central and northern length are so heavily infested with simulium flies ("merihui," "borrachuda") that human habitation in the dry season is rendered exceedingly difficult.

MAMMALS (MAMMALIA)

Members of this class are common, and are the most important ethnozoologically of all classes of South American animals. As noted on previous pages, there is an abundance of rodents, many of large size, but there is also a scarcity of large ungulates. Three mammals were domesticated: the llama, alpaca, and cavy (guinea pig); and many others were semidomesticated or culturally closely integrated. Of 38 families of land mammals, 23 are primary endemics; and there are 8 additional families of marine mammals which are nonendemics. (See Cabrera and Yepes, 1940.)

Order MARSUPIALIA: Opossums

All opossums are primary endemics, belonging to the families Didelphidae and Caenolestidae, and the order is distributed over Neotropica except Antillea. Most of the species are small and unimportant, although one, the common large opossum (*Didelphis*, "gamba," "sarigue," "chucha"), may be important for food throughout continental Neotropica, except most of Patagonia-Chilea. It is abundant where present and easy to capture.

Order INSECTIVORA: Insectivores

Family Nesophontidae, Antillea: These small rat and mouse-sized mammals are thought to be extinct, though some lived at least until early post-Columbian times in Cuba and Hispaniola. They were part of the archaic Antillean fauna which was exterminated by man's occupation; none was known to have been eaten.

Family Solenodontidae, solenodons; also of the Greater Antilles exclusively: Three species are known, all the size of a large rat or small cat. They are the "ayre" of Oviedo (*Solenodon paradoxus*) from Hispaniola, and the "almiquis" (*S. cubanus* and *S. poeyanus*) of Cuba. Formerly, they were abundant, but now are becoming extinct through man's agency. Both are members of the archaic Antillean fauna; none was an important source of food.

Family Soricidae, shrews: One genus (*Cryptotis*) is intrusive into Central America and extreme northern South America from Nearctica. Its several species are unimportant to man, but its distribution shows the natural route of entry of one form of Nearctic invader—the more temperate form which is confined to mountains in its southern distribution. *Cryptotis* is a mountain form in Central America and northern South America, though it is widely distributed altitudinally in its Nearctic range (eastern United States). Evidently *Cryptotis* penetrated the mountains of Central America, and thence to the middle range of the Colombian Andes, from where it spread east to the western Venezuelan Andes (dead end?), and south to southern Ecuador, where it evidently has been blocked by the Huancabamba Valley. It has not been taken in the low western Colombian Andes, nor in the isolated high Santa Marta range in northern Colombia. (See Tate, 1932.)

Order CHIROPTERA: Bats

Neotropica has 10 families of bats, of which 7 are primary endemics. The true blood-sucking vampires (Desmodontidae) are the most important; some others enter into folklore; and some were eaten like the fruit bats of the Old World. The true vampires, "vampiros" (*Desmodus rotundus, Diaemus youngi, Diphylla ecaudata*) are found in

Guiana-Brazilia and Central America, and are the only sanguivorous bats in the New or Old World. They are of small size (body 6 to 8 cm., or 2½ to 3½ inches; wingspread 20 to 30 cm., or 8 to 12 inches) with small ears and long thumbs. Each upper central incisor is lance-like with an acute point and a razor-sharp sloping lateral edge; each upper canine is long, sharp, and with a rear cutting edge; the other teeth are vestigial. There is no nose "leaf," or tail. Vampire bats can crawl actively on walls of their cave homes, or on their victims, or on the ground nearby. The skin of the victim is opened by the cutting incisors, and the flowing blood is lapped, not sucked; the saliva may contain an anticoagulant (Bier, 1932). These bats are severe pests where common; they feed exclusively on fresh blood and victimize man and domestic animals as well as wild species. They cause considerable physical discomfort and mental anguish, and today they are known to carry rabies on Trinidad Island and horse tryanosomiasis ("mal de cadeiras," "quebra bunda") in southern Brazil, where high losses of horses have occurred. However, they have not been incriminated as a vector in similar epidemics on the Ilha de Marajó, at the mouth of the Amazon. Their importance as vectors of diseases in aboriginal times is not known, but the presence of vampires in the foothills of Northwest Argentina is said to prevent alpaca raising today, and probably this was also the case formerly (Romero, E. C., 1927, pp. 99–100; see also Ditmars and Greenhall, 1935; Allen, G. M., 1939). Ignacio de Armas (1888, pp. 25–26), under the name "*Phyllostomus spectrum*," noted Oviedo's remarks on the vampire bat and such cures as placing hot embers or hot water on the bleeding incision. The former author also noted the depredations of the bats on the exploring parties of Balboa in Panamá, Garay in "Pánnco," Diego de Ordaz along the Orinoco, Herreira in New Grenada, and Cabeza de Vaca in Paraguay. The bats molested not only human beings, but also horses, cattle, and chickens, to such an extent that the expeditions or settlements were endangered. Presumably such vampire-human relationships reflected the general conditions under which the aborigines lived in these regions.

The large chiroptivorous bull-dog bat (*Phyllostomus hastatus*) is much larger and more fearsome-appearing than the vampires, but it is not dangerous to man or to most other animals except small bats. Other species of bats are unimportant.

Cobo (1890–95, bk. 14, chap. 11, p. 205) said that the wool of "murciélago" (bat) was woven into cloth with that of vicuña. This statement has been quoted though it is not known to have been verified by subsequent microscopic wool examination. Bats of the middle Andean region are small and have short wool, and are not known to inhabit caves in abundance great enough to supply wool for a textile art; nor is it seen how, in any way, bat wool could be advantageous in weaving, though the short hairs with rough cortical scales arranged in distinct nodes should felt well. Pteropid fruit bats of the Indo-Australian region have a wool of 2 to 3 cms., and long enough to weave, but these do not inhabit South America.

Order PRIMATES: Monkeys and Marmosets

This order is found in Guiana-Brazilia and Central America. Monkeys are important as food because of their vegetable and fruit diet, and as pets because of their relatively high intelligence and human appearance.

Family Callithrichidae (syn. Hapalidae), marmosets, "saguims," "titis": There are many species of marmosets, but all are small and squirrellike, with a long but nonprehensile tail, monkey face, and claws on all digits except the big toe. They are utilized principally as pets.

Family Cebidae, monkeys, "macacos," "monos." There are 11 distinct groups (genera) of monkeys and they are confined to the tropical part of Neotropica, except the Antilles. All are used as food and pets, but some are more desirable than others, particularly the capuchin, or roll-tailed monkey ("prego," "machin," *Cebus*, pl. 36) the spider monkey ("coatá," "marimondo," *Ateles*); the woolly monkey ("barigudo," *Lagothrix*); and the howler monkey ("guariba," "alouate," *Alouatta*, pl. 36). All these genera are of large size (3 to 9 kg., or 6 to 20 lbs.).

Monkeys are hunted by stealth and bow and arrow, or blowgun and poisoned dart. *Cebus* can be decoyed by calling. Pets are obtained usually as babies from their slain mothers.

Ignacio de Armas (1888, pp. 23–24) believed that many alleged cases of cannibalism, especially of children, in the early Spanish accounts, stem from observations of natives eating monkeys, not human beings. He also noted the observations of Humboldt, Schomburgk, and Bates on the ease of making such an interpretation even when personally participating in a meal of known monkey meat. However, cannibalism was practiced in Neotropica to some extent.

No monkeys occurred naturally on any Antillean island except Trinidad, and possibly Barbados. However, archeological remains of cebids have been found in Cuba (a spider monkey, the *Montaneia anthropomorpha* of Ameghino) and Hispaniola (the genus not certain; Miller, 1916; 1929, p. 5), thus indicating travel and commerce between the Greater Antilles and the mainland, especially Central America, with accompanying inferences of ocean navigation on the part of the natives.

Family Hominidae, man; entire Neotropica: All members of this family in Neotropica are *Homo sapiens;* no undisputed fossil species are known. (See McCown, this volume, p. 1; Hrdlička et al., 1912.) Subspecies or races, as the result of biologic responses to certain environments, are not discussed here.

Primitive man was, and is, definitely an important dominant element of the natural fauna. As a sedentary or roving intelligent species living in small groups with intragroup cooperation and intergroup conflict, preying on animal life throughout the year, and gathering vegetable food seasonally, he had in general a strong adverse effect on his environment. He built cultures around nuclei of large populations through his organizing, cooperative activities; he drove out, captured, or exterminated his human enemies, or vice versa; he wastefully depleted his neighboring animal and plant food to the point, perhaps, of contributing to the extermination of some species; he deforested by fire, and caused erosion and change in local bioecology; and he also domesticated and cultivated to the point perhaps of saving certain species from extinction.

The infiltration of primitive man into South America from North America was relatively slow because of the narrow entrance through Central America and the different and unfavorable environments which he encountered in comparison with those on the southern fringe of Nearctica. Probably southern Nearctic man, before penetration into South America, was predominantly an adaptive of the open terrain, high altitude, dry and fairly thin air, and large range of diurnal temperature of the southern Highlands of Mexico. Penetrating into post-Pliocene Neotropica, he encountered heavy forest, low altitude, humid and heavy air, and hot and constant temperature. This is today a difficult environment for temperate man because of the difficulty of regulating body temperature and the resulting physical and mental lassitude even despite man's efficient temperature-regulating mechanism. This environment and climate have their world's largest distribution in South America. It is likely that river travel was well developed before man adapted himself successfully (relatively speaking) to the vast, humid, tropical regions of South America.

A second difficult environment for man to meet adaptively was that of the high paramo-punas of the Andes from Colombia to Chile, especially in Perú and Bolivia where extensive tablelands offer the second largest high altitude habitable area of the world (the largest is Tibet in Asia). Here, extremely thin and dry air, great range of diurnal temperature, and perhaps scarcity of food offered considerable obstacles. However, human beings, perhaps hill and mountain people, adapted themselves successfully to this extreme environment. The desert conditions of west coastal Perú and northwest coastal Chile were also met with appropriate physiologic adaptation to constantly high temperature, dry air, and scarcity of water. Man can endure and adapt himself better to hot or cold dry climates than to hot and humid ones, if he can obtain sufficient water and salt. In fact, man appears to have been stimulated to his greatest physical and mental vigor in adverse environments in Neotropica, except in the humid lowlands where perhaps he never really successfully has adapted himself. If man entered at an early date, say 10,000 to 20,000 years ago, he probably encountered less difficulties of climate and environment than today because of a general southward shift of isotherms and climatic belts during the expiration of the last ice age.

No anthropoid ape nor cercopithecid monkey (Old World type) is known to occur naturally in Neotropica (or in any part of the New World), though two West African guenon monkeys (of the genus *Cercopithecus*) were introduced in the early 18th century: *C. sabaeus* has become established on Grenada and *C. mona* on Barbados and St. Kitts in the Lesser Antilles (Allen, G. M., 1911, pp. 251–253). The spurious anthropoid ape (*Amer-anthropoides loysi*) described by Montandon (1929 c) from notes and photographs originating in northeast Colombia, is certainly a brown spider monkey, *Ateles hybridus* (the *Ateles belzebuth hybridus* of Kellogg and Goldman, 1944, p. 27; see also Ashley-Montagu, 1929; Cabrera, A., 1930; and Hooton, 1942, pp. 271–273).

Order EDENTATA: Sloths, Armadillos, and Anteaters

All edentates are exclusively Neotropical primary endemics, and truly are among the queerest of beasts in the animal kingdom. The order includes the extinct giant armadillos and extinct ground sloths, some members of which were contemporaneous with early man who perhaps "contributed" to their extinction.

Family Bradypodidae, tree sloths, "preguiças," "pericos"; two-toed (*Choloepus*), and three-toed (*Bradypus*): Both the two-toed and three-toed sloths are utilized for food and are taken easily without weapons. They are sluggish, and they hang or progress along branches upside-down or sleep in a crotch, but rarely are found low enough or concentrated in numbers large enough to form a reliable source of food. Individuals are taken often when the forest is felled, especially when this is done rapidly with modern axes. *Bradypus* apparently is semirestricted to the embauba tree (*Cecropia*), whose leaves it relishes. The embauba, however, is myrmecophilous and is inhabited by a species of vicious, highly poisonous, tiny, red fire ant, which apparently does not molest the sloth, but effectively prevents climbing the tree or attack upon the sloth by other animals or by man. Sloths have teeth and can inflict a painful bite. *Choloepus* weighs 5 to 8 kg. (11 to 18 lbs.); *Bradypus*, 2 to 4 kg. (4½ to 9 lbs.).

Family Dasypodidae, armadillos, "tatus," "quirquinchos," "cachicamos", etc.; nine-banded and relatives (*Dasypus*), six-banded (*Euphractus*), hairy (*Chaetophractus* and *Zaedius*), soft-tailed (*Cabassous*), giant (*Priodontes*), three-banded or ball armadillo (*Tolypeutes*), and pygmy (*Chlamyphorus*): All armadillos are utilized extensively for food where they are common, particularly the *Dasypus* (pl. 42), which is widespread over all tropical and semitropical Neotropica, is very tasty, and is a relatively poor burrower. Carapaces are used often as containers. All types can be taken by hand, but pursuit and capture is aided by dogs. All species have teeth (simple pegs), but are quite harmless.

Family Myrmecophagidae, anteaters, "tamanduas," "oso hormigueros"; pygmy or silky (*Cyclopes*), common (*Tamandua*), and giant (*Myrmecophaga*, pl. 37); Guiana-Brazilia and Central America: None of the anteaters is very important ethnozoologically, though the pygmy and giant species are striking enough in form and behavior to elicit attention, and the giant anteater can be a dangerous adversary, striking laterally with powerful, huge-clawed forefeet. All are truly edentulous.

Family Glyptodontidae, glyptodonts or extinct armadillos: Many genera were common in the Pleistocene and some survived until the Recent time when they were contemporaneous with early man, who probably hastened their extinction by pursuit and annoyance. Some were huge, the size of a bear.

Families Megalochnidae, Megatheriidae, Megalonychidae, and Mylodontidae, extinct ground sloths: Remains of many genera have been found in the Pleistocene of Neotropica, expecially in Patagonia-Chilea, and some occurred far north into North America. A few species survived until a late Recent date to judge from the freshness of bone, skin, dung, and even blood from certain spots in Patagonia, the Andes, the Antilles, and Arizona. These are known to have been contemporaneous with, and probably to have been hunted by, primitive man, who may have hastened their extinction. It is improbable, however, that ground sloths were stabled in caves at Last Hope Inlet (Ultima Esperanza), Patagonia, by primitive man and used as a semidomesticated food animal, as has been claimed. (See Bird, 1938 a; also Beddard, 1902, p. 182; Ley, 1941, pp. 189–193.)

Order RODENTIA: Rodents

The Rodentia include a multitude of species of many families. The most important in Neotropica are the Hystricomorpha and the myomorph family Cricetidae.

Suborder DUPLICIDENTATA

(Often considered as a distinct order, Lagomorpha)

Family Leporidae, rabbits and hares: In Neotropica, as secondary endemics, are small cottontail rabbits, "coelhos," "conejos" (*Sylvilagus*), which are common in Guiana-Brazilia and Central America and are much utilized for food. They are taken by any weapon, snares, or by hand, often with the aid of dogs.

The European hare (*Lepus europaeus*) and the European rabbit (*Oryctolagus cuniculus*) have been introduced recently into the Patagonia-Chilea subregion, where they are now feral in great numbers and are important faunal elements and food sources. They were introduced also into some of the Lesser Antilles, but failed to become well established.

Suborder SIMPLICIDENTATA

This suborder includes all other rodents; often considered as the true order Rodentia.

Infraorder HYSTRICOMORPHA

There are many families of hystricomorphs, whose distinction, in some cases, is doubtful, but which are included here for easier recognition. They are primary endemics and are exclusively Neotropical except for some distant families in Africa, one of which extends to southern Asia.

Family Erethizontidae, porcupines, "porco espinhos": There are several genera (*Coendou*, *Echinoprocta*, *Chaetomys*) found in the Guiana-Brazilia and Central America subregions. They are of rather large size (2 to 4 kg., or 4½ to 9 lbs.), and are lethargic and defenseless against man; hence they are easy prey. The meat is eaten and the quills may be used for clothing adornment. *Coendou* (pl. 42) is the most common and widely distributed; it possesses a dorsally prehensile tail which is unique among mammals. The North American porcupines (*Erethizon*) are of Neotropical origin, but are now extinct south of the southwestern United States.

Family Dinomyidae, tailed paca, "pacarana" (*Dinomys branickii*): This species is the only living member of its family and is found in the eastern central and northern Andes. It is large (10 to 15 kg., or 22 to 33 lbs.), lethargic, a prized food animal, now rare though probably commoner in aboriginal times, and is so easily tamed that it would appear to be domesticable.

The family included other members, which are now extinct. They included the large "quemi" (*Quemisia quemi*) of Oviedo y Valdés from Hispaniola and the Puerto Rican quemi (*Elasmodontomys obliquus*), as well as the large (black-bear size) *Amblyrhiza inundata* from Anguilla and San Martín Islands in the extreme eastern Greater Antilles (Allen, G. M., 1942, pp. 126–128). The quemis were formerly abundant on their islands of the Greater Antilles; they were contemporaneous with man, and were utilized for food, perhaps to the point of extinction (Miller, 1929).

Family Echimyidae, bristle and spiny rats of several genera: These stiff-haired rats are found in the Guiana-Brazilia and southern Central America subregions. The bristle rat (*Proechimys*, pl. 41), the size of a house rat, is one of the commonest small mammals of the jungle; it has white tasty flesh, and is probably an important food animal. The spiny rats (*Echimys*, *Mesomys*) are less common and less important; some are arboreal.

The recently extinct *Brotomys* of Hispaniola and *Boromys* of Cuba (the "mohuys" of Oviedo y Valdés) were common in aboriginal times, and were stated to have been greatly esteemed as food. Their extinction was accelerated by man with his agriculture and introduced competitive animals. The bony remains indicate that the mohuys were similar to *Proechimys* in size and structure.

Family Capromyidae, hutias: The hutias are exclusively Antillean, and many species have become extinct since the arrival of primitive and civilized man. Most were the size of a large rat or a small cat; and probably all were highly palatable and constituted an important source of food in aboriginal times. Oviedo's "hutia" of Hispaniola was probably *Plagiodontia* or *Isolobodon*, or both (Miller, 1929). Krieger (1929, p. 19, quoting Oviedo y Valdés) stated that a ". . . *Plagiodontia* was reserved for the exclusive use of the cacique and his family." One species (*P. hylaeum* of Hispaniola) is still living (Miller, 1927).

The abundance and diversity of the capromyids in the Greater Antilles and their importance in the archaic fauna, which once was utilized extensively by primitive man and is almost extinct today, are shown as follows: Of 18 known species of capromyids, 9 are extinct and subfossil in caves and middens, 7 are living and rare (approaching extinction ?), and 1 is of doubtful status. G. M. Allen (1942) included the capromyids with the Echimyidae.

Family Heptaxodontidae: This family represents a distinct group of once numerous but now entirely extinct rodents of the Greater Antilles. All were primary endemics, similar to the echimyids in size and somewhat similar to the dinomyids in structure, and were contemporaneous with aboriginal man as late as early post-Columbian times. Remains have been found in middens and caves of Puerto Rico (*Heptaxodon bidens*) and Jamaica (*Clidomys osborni* and *C. parvus*, *Spirodontomys jamaicensis* and *Speoxenus cundalli;* Allen, G. M., 1942, pp. 125–126; Anthony, 1925–26, p. 206).

Family Dasyproctidae, agoutis, "cutias," "jochis"; primary endemics, exclusively Neotropical: The common agouti (*Dasyprocta*, pl. 41) is probably the most important year-round food animal in the jungles of Guiana-Brazilia and Central America, and is easily hunted with bow and arrow or blowgun from ambush, or taken by snare or by hand after being run to cover in a shallow burrow or hollow log by dogs. It is large (2 to 4 kg., or 4½ to 9 lbs.), diurnal, a woods inhabitant, cursorial and not a burrower, highly palatable, and common. It has been introduced recently into some islands of the Greater Antilles (Howes, 1930). The smaller, wire-tailed *Myoprocta* is of less importance and is more restricted in range (northern Guiana-Brazilia).

Family Caviidae, cavy, mara, and capybara, and perhaps paca; all primary endemics and exclusively Neotropical: This is an important family.

The cavies, "preas," "cuis," and "coris" (*Cavia*, pl. 38, *Galea*, *Microcavia*, and *Kerodon*) are common over most of Neotropica (except Central America and the Antilles) in grasslands, brush, or highlands (puna-steppe), but generally they do not occur in heavy jungle. They are relished for food, and are diurnal and easily caught. One member, the common cavy, or guinea pig (*Cavia porcellus*), has been domesticated (see p. 454) probably from the wild cavy of Perú.

The mara, Patagonian hare or cavy (*Dolichotis australis*, pl. 36), found in the Patagonia-Chilea subregion, is an important food animal; it is large (75 cm., or 30 in., long and weighs 10 to 15 kg., or 22 to 33 lbs.), diurnal, and a semigregarious, plains inhabitant. Recently it has been farmed for meat and fur in Argentina. The dwarf mara (*Pediolagus salinicola*) is found on the saline flats of Northwest Argentina, and is less important.

The capybara (*Hydrochoerus hydrochaeris*, pl. 40), of Guiana-Brazilia and Central America, is the largest living rodent (50 to 75 kg., or 110 to 165 lbs.), and is gregarious, aquatic, common, and an important source of food and hides. It can be taken by bow and arrow or pit trap.

The paca (*Cuniculus paca*, syn. *Aguti* and *Coelogenus*, pl. 38), also found in the Guiana-Brazilia and Central America subregions, is considered one of the most desirable of food animals because of its delicious, whitish meat. It is large (to 10 kg. or 22 lbs.), solitary, a woods inhabitant, and is hunted with dogs, which drive the paca into a burrow or the water. It is considered by some authors as belonging to a distinct family.

The recently extinct paca (*C. thomasi*), found in Machu Picchu tombs and middens, was used perhaps ceremonially as a food offering to the deceased (Eaton, 1916). It may be considered as having been a semidomesticated animal. The species was characterized by small size and large tympanic bullae, and was closely related to but probable not derived from the living mountain paca (*C. taczanowski*).

Family Chinchillidae, chinchillas and viscachas; Patagonia-Chilea: Primary endemics and exclusively Neotropical.

The chinchilla (*Chinchilla chinchilla*) lives in the High Andes of Chile, Argentina, Bolivia, and Perú. It is small but highly prized for its extremely soft and thick fur, which in *Inca* times was reserved especially for members of the royal family. The meat was eaten by the lower classes. The animal is now almost extinct, though it is "farmed" in Argentina, Chile, the United States, and Switzerland for its fantastically high-valued fur.

The viscachas are important food animals and are used also for fur and wool. Both Garcilaso and Cieza de León remarked on the fine quality and high value of viscacha robes. The mountain viscacha (*Lagidium*, several species) occurs in the High Central and Southern Andes; it is of cat size (1 to 2 kg., or 2 to 4½ lbs.), and is semigregarious in large scattered colonies in the rocks. The plains viscacha (*Lagostomus maximus*, pl. 41) is found on the humid pampas of eastern Patagonia-Chilea, where it is the most common mammal (Hudson, 1892, p. 10). It is the size of a small dog (5 to 8 kg., or 11 to 17 lbs.) and is gregarious in numerous and compact but small colonies in ground burrows.

A recently extinct "plains" viscacha, *Lagostomus crassus*, was described from late Recent deposits near Cuzco, Perú (Thomas, O., 1910, p. 246), and a lower incisor of *L. crassus* or *L. maximus* was reported from a Machu Picchu grave by Eaton (1916, p. 57). Both occurrences indicate probable utilization by man of a now extinct species, and the recent extinction of the group over an extensive northern area, perhaps accompanied by progressive aridity and devegetation of the region.

Family Octodontidae, certain "octodont" rats and mice; Patagonia-Chilea exclusively; primary endemics: There are six genera, of which the tuco-tuco (*Ctenomys*) is probably the most important. This animal is a burrower in colonies, is of rat size, and can be captured by hand. It was used for food by the *Ona* and *Tehuelche*.

Family Abrocomidae, other octodonts; High Andes of southern Bolivia to middle Chile; primary endemics: The abrocoma is of large rat size, with dense and soft fur and palatable flesh. One extinct species (*Abrocoma oblativa*) was described from remains found in tombs at Machu Picchu, Perú, by Eaton (1916). Its recent extinction reduced the range of the genus in the north, as is the case of the plains viscacha, perhaps for similar reasons of climatic change or human persecution. Eaton was convinced that this extinct abrocoma was used as a food offering in burial rites of the Machu Picchuans. If so, it might have been semidomesticated or even completely domesticated. Certainly this custom was a local phenomenon and disappeared with the death of the city, but if the custom and the associated mammal had become more widespread, *A. oblativa* might be an existent domesticated animal today. Its origin even might be sought in north Chile, which is the home of the living, slightly smaller *A. bennettii.*

Suborder SCIUROMORPHA

Family Sciuridae, squirrels, "caxíngueles," "ardíllas"; Guiana-Brazilia and Central America; secondary endemics from post-Pliocene Nearctic stock: This entire suborder is represented in Neotropica by tree squirrels only; there are no ground squirrels or other sciuromorphs. There are several genera, but these are of little importance to the aborigines because of the difficulty in hunting. All are arboreal, diurnal, and palatable.

Suborder MYOMORPHA: Regular Rats and Mice, "Ratos," "Camondongos," "Pericotes"

Family Cricetidae, cricetid rodents; entire Neotropica except Antillea; secondary endemics: There are many genera, but most are small and unimportant, except possibly the large members of *Oryzomys* (most common genus), of which one species (*O. xanthaeolus*) is exceedingly common in south Coastal Perú in quadrennial cycles when it devastates the crops, as it probably has done for millennia. There are numerous figures of rats eating corn on the pre-Columbian pots in the museum in Lima (Gilmore, 1947, p. 236). The large bank-rat (*Nectomys squamipes*) is common in the woods of Guiana-Brazilia and may be of value as food.

The so-called "muskrat" of the Lesser Antilles (*Megalomys;* not the muskrat of North America, *Ondatra*) was a large rat (to 70 cm., or 30 in., total length), and was apparently prized for food. It lived on Martinque, St. Lucia, and Barbuda Islands until post-Columbian times, but it is now probably extinct, another victim of man's competition. (See Allen, G. M., 1942, pp. 90–93.)

"Domestic" house rats and mice (*Rattus* and *Mus*) of the family Muridae accompanied the White man in his occupation of the Antilles and the continent, and in many places are exceedingly common. However, they generally are confined to the larger centers of population and do not enter into aboriginal ethnozoology, though Miller (1929) believed that Oviedo's "mures y ratones" on Hispaniola were introduced *Mus.*

Family Heteromyidae, pouched rats and mice: One genus (*Heteromys*) is geologically a late intruder into northern South America from Central America. It is unimportant ethnozoologically, but its distribution shows the natural routes of a lowland invader from Nearctica upon arrival in South America: south, down the west coast and low ranges of the Andes of Colombia to western Ecuador, down the Cauca and Magdalena River valleys of Colombia (dead ends ?); and east, along the north coast of Colombia to northern Venezuela. *Heteromys* has attained the Meta region of eastern Colombia, presumably around the northern end of the Venezuelan Andes. (Compare with the mountain distribution of a highland invader, *Cryptotis* (p. 364).)

Order CARNIVORA: Carnivorous Mammals

In Neotropica, this order includes members of all living families except the Hyaenidae and Viverridae (and viverrids are represented now on several Antillean islands, and in British Guiana (?), by the introduced mongoose, *Mungos birmanicus*).

Family Procyonidae, raccoons, "quatis," "coatimundis" (*Procyon* and *Nasua*), and the arboreal and nocturnal kinkajous, "juparas" (*Potos*, pl. 42, and *Bassaricyon*); secondary endemics, perhaps accidentally intrusive from Nearctica before Pliocene contact: All members of this family tame easily when young, and are important as pets. *Nasua* is very common and may have been used also for food. *Potos* may be connected with the Amazonian "jupara" ceremonies.

Family Mustelidae, otter, "lontras," "nutrias" (*Lutra* and *Pteroneura*); skunks, "jaratatácas," "zoríllas" (*Conepatus*); weasel, "comadréja" (*Mustela*); hurons (*Grison*, *Galictis*, *Lyncodon*); and iraras or tayras (*Tayra*); entire Neotropica except Antillea; secondary endemics: A few species are important. The common river otter (*Lutra*) is found in most fresh-water streams, is easily tamed, and makes an affectionate pet, and is said to have been used for fishing in Colombia (Smith, *in* Allen, J. A., 1904, p. 454). In southern México and adjacent regions, the river otter had much mythological and religious significance, especially in connection with drowned persons and hunting rituals (Ignacio de Armas, 1888, pp. 46–47), and these customs may have spread to nearby Central America. The culture trait of fishing with tamed otter was not as common in the New as in the Old World. (See Gudger, 1927.) The giant river otter, "ariranha" (*Pteroneura brasiliensis*), occurs in the Orinoco, Amazon, and La Plata River systems, and is conspicuous by its large size (to 2 m., or 6½ feet, total length). The skin is believed by some to be impervious to water and hence valuable for clothing or other protection (Cabrera and Yepes, 1940, p. 157). The marine otter, "chinchimen" (*Lutra felina*), of south coastal Chile and Patagonia, was hunted extensively for fur (and meat ?) by the *Chono* and *Alacaluf*, often with the aid of especially trained dogs. (See Gudger, 1923, p. 567.) The huron (*Galictis furax*) was tamed by the natives of southern Bolivia and northern Chile to hunt chinchillas in their burrows, much as the ferret was trained to hunt rabbits in Europe (Bridges, 1846, p. 482). Cieza de León's remark (Markham's ed., 1864, p. 402) that these were the best ferrets in the world indicate the high degree of training and the pre-Colombian origin of the trait.

Family Felidae, cats of many sizes and colors, some spotted; entire Neotropica except Antillea; secondary endemics: The most important are the jaguar, puma, and ocelot. The jaguar, "onça," "tigre" (*Felis*, or *Panthera*, *onca*, pl. 39) of Guiana-Brazilia and Central America, is large (50 to 100 kg., or 110 to 220 lbs.), a jungle inhabitant, truculent, common where proper food is available, and a highly desired hunting trophy. It is killed by special techniques, one of which involves provoking a charge and impaling the animal on a spear with butt braced on the ground. The jaguar is important in folklore and mythology, as well as a deity and totemic animal, and with the puma was used by the *Inca* to punish criminals. The puma, "onça sussuarána," "leon" (*Felis*, or *Puma*, *concolor*, pl. 39), ranges over entire Neotropica except Antillea; in fact, it has the greatest range of any mammal species in the Western Hemisphere, occurring from central Canada to Tierra del Fuego, from the Atlantic (formerly) to the Pacific, from mountain top to jungle, and over plains and deserts. It is large (50 to 75 kg., or 110 to 165 lbs.), prized as a hunting trophy, and especially common in Patagonia-Chilea where lamoid camelids and, more recently, sheep form an abundant food supply. It was captured by the *Inca* in their vicuña "drives" (chacos) and used as an instrument of torture and execution (lion pits). The feline motif of Highland Andean cultures may be based on the puma, and perhaps also on the jaguar. The ocelot, "jaguatieríca," "tigrillo" (*Felis*, or *Leopardus*, *pardalis*, pl. 37), is a beautifully striped and spotted cat of medium size (10 to 12 kg., or 22 to 26 lbs.) which ranges over Guiana-Brazilia and Central America. It is common, a jungle inhabitant, tamable when young, and often kept as a pet, perhaps by the *Inca* higher classes for pomp and probably for symbolism also. The Museo Chiclín has a figurine which portrays a tame ocelotlike cat at the foot of a high official who is seated on a throne.

The marbled cat (*Felis bracatta*), of the southwestern Brazilian planalto, has been suggested, without confirmation, as the wild progenitor of the "Brazilian tortoise-shell cat" by Ballou (1897).

Family Ursidae, bears, "ursos": This family is represented in Neotropica today by one relict species, the spectacled bear, "jucumári" (*Tremarctos ornatus*), which is found on the High Eastern Andean slopes from Venezuela to Bolivia. It seems to be an important animal in legends in the southern part of its range, and many fantastic qualities and even shapes are attributed to it. The recently extinct bear (*Arctotherium brasiliensis*) from Lagoa Santa caves, in eastern Brazil, probably was contemporaneous with early man.

Family Canidae, dogs, foxes; entire Neotropica except Antillea; secondary endemics: All the native Neotropical canids are foxes, with the exception of the bush dog. The tawny wild dog, "perro cimarrón" of Argentina, has been shown by A. Cabrera (1934) to have been a feral pariah dog of European stock brought in by the Spaniards. A true wolf (*Canis nehringi*) existed in Argentina in late Pleistocene (and early Recent ?) times, but it is not known to have been contemporaneous with early man. Nor is it known that the blood of any Neotropical fox has entered into any breed of aboriginal dog despite assertions by Latcham (1922). Rarely do foxes and true dogs cross, and then the offspring may be infertile. However, Krieg (1925) reported two litters from a cross between "*Pseudalopex azarae*" (=*Dusicyon gymnocercus*) and a fox-terrier hybrid (terrier × fox ?). (See p. 424 for discussion of dogs.)

The classification of the South American canids is as follows:

OSGOOD, 1934

- Family Canidae
  - Subfamily Caninae
    - *Dusicyon*
      - (*Dusicyon*) *australis*
      - (*Dusicyon*) *culpaeus*
      - (*Dusicyon*) *gymnocercus*
      - (*Dusicyon*) *griseus*
      - (*Dusicyon*) *sechurae*
      - (*Dusicyon*) *microtis*
      - (*Lycalopex*) *vetulus*
      - (*Cerdocyon*) *thous*
    - *Urocyon cinereoargenteus*
    - *Chrysocyon brachyurus*
  - Subfamily Cyoninae (Kraglievich, 1930 b)
    - *Speothos venaticus*

CABRERA AND YEPES, 1940

- Family Canidae
  - Subfamily Caninae
    - *Dusicyon australis*
    - *Pseudalopex culpaeus*
      - *gymnocercus*
      - *gracilis*
    - *Lycalopex sechurae*
    - *Atelocynus microtis*
    - *Lycalopex vetulus*
    - *Cerdocyon thous*
    - *Urocyon guatemalae*
    - *Chrysocyon brachyurus*
    - *Icticyon venaticus*

The forest fox, "raposa do matto," "zorro" (*Dusicyon thous*, syn. *D. cancrivorus*) is found over the forested region of Guiana-Brazilia and extends to Tucumán in the south. This species was said by Latcham (1922, p. 17) to have been domesticated in northern South America, and to cross with the true (European) dog. He also suggested that it may have been the progenitor of the aboriginal hairless dog. His assertions as to its easy interbreeding with dogs and its being the ancestor of the hairless dog are probably incorrect, but that the species may have been tamed and even semidomesticated is indicated by Latcham's quotation from Oviedo y Valdés. The description of the animal in this account corresponds well to *D. thous*, but Oviedo stated that he saw only one individual which had been brought to Hispaniola from Cartagena. The crab-eating propensity of the species, described by Oviedo and others, has not been verified subsequently as a characteristic trait, and probably the story resulted from a confusion of the fox with beach-scavenging feral dogs, or even with the large raccoon, "guachinín" (*Procyon cancrivorus*). Rare individuals of *D. thous* conceivably might have been the basis of some of the numerous descriptions of a mute dog, "perro mudo," which was noted in northern South America in early colonial times. (See p. 425.)

The "culpeo," Andean fox (*Dusicyon culpeus*) is a large fox of the southern Andes and Patagonia. Latcham (1922, p. 19) erroneously considered it as having been the stem form of the aboriginal Patagonian and Fuegian dogs.

The large maned fox, "lobo do matto," "zorro de crin," "aguará-guazú" (*Chrysocyon brachyurus*, syn. *C. jubatus*, pl. 42) is a huge fox (weight, 20 to 30 kg. or 44 to 66 lbs.) with large ears and extremely long legs (height at shoulder, to 90 cm., or 36 inches), and short body and tail. It lives in the bush and forest patches of the plains of southern Guiana-Brazilia (Bolivia and central Brazil to Paraguay and Uruguay), and is a striking animal in form and behavior. Latcham (1922, p. 14) stated that it might have been the progenitor of the "perro cimarrón," quoting Torres, who identified dog remains from sites on the Río Paraná as of the latter type. The maned fox was suggested also by Latcham as possibly the greyhoundlike dog of the Guianas, but this seems highly improbable, and Latcham cited other authors who derived this greyhound from European stock (1922, p. 20).

The bush dog, "cachorro do matto," "perro de monte" (*Icticyon venaticus*, or *Speothos venaticus*) is an aberrant, short-legged, short-tailed fox-dog with reduced molar formula (M ½ instead of ⅔). It is found in the forests of Guiana-Brazilia and in southern Central America (*I. panamensis*), but is considered to be rare. It tames easily, and may have been seen in a tamed or semidomesticated condition in northern South America by the early Spaniards and, with the tamed forest fox, may have been considered a "perro mudo," though it can emit a short rasping bark (see Bates, M., 1944), as can the fox. (See p. 426.)

Family Otariidae, eared seals (fur seals) and sea lions; mostly Patagonia-Chilea: The fur seal, "lobo marino de dos pelos" (*Arctocephalus australis*), is hunted for fur and meat with harpoons and nets, especially from Perú south to Patagonia. The young can be captured easily during the breeding season on outlying rocks, and they may have been an important seasonal item of food for the Indians (Townsend, 1910, p. 11). After the Spanish Conquest, hundreds of thousands were killed for fur, until now it is almost extinct. *Arctocephalus* is a circumantarctic genus, extending north only in the Western Hemisphere, to Guadalupe Island, Baja California. (The famed northern fur seal of the Bering Sea is a different genus, *Callorhinus*.)

The sea lion, "lobo marino de un pelo" (*Otaria flavescens*), also of the southern coasts extending to Perú, is large, sexually dimorphic (males much larger than females), and was hunted by the *Yahgan* and *Alacaluf* in open water with harpoons and nets, and on breeding rookeries with clubs and spears, for hide and meat. The inflated hides were used as boats by the *Chango* of North Chile (Bird, Handbook, vol. 2, p. 597). It was important economically, was terrifically persecuted for hide and oil after 1700, and is now much reduced in numbers.

Family Phocidae, sea elephant and seals; mostly Patagonia-Chilea: The sea elephant, "elephante marino" (*Mirounga leonina*), occurs along the southern coasts and adjacent Antarctic islands. It is a huge, clumsy animal, and probably is utilized for food and hide, though usually it is obtained accidentally.

The leopard seal (*Hydrurga leptonyx*), Weddell seal (or shore seal, *Leptonychotes weddellii*), and crab seal (or shrimp seal, *Lobodon carcinophagus*) occur on the southern coasts, and they are hunted with harpoons and nets for hide and meat by the *Chono*, *Alacaluf*, and *Yahgan*. The monk seal (*Monachus tropicalis*) of Antillea, now nearly extinct, probably was utilized by the aborigines, but apparently no information on hunting techniques and uses have been recorded, although the Spaniards used the seal for leather and oil.

Order CETACEA: Whales and Porpoises (Dolphins)

Family Iniidae, river dolphins. The black river dolphin, "boto" (*Inia geoffroyi*), of the Orinoco and Amazon Rivers, and the gray beaked dolphin (*Stenodelphis blainvillei*) of the La Plata River, are utilized for food and oil, and enter into aboriginal folklore and medicine. Along the Amazon River, it is believed by some Indians that the boto is transformable into a singing siren or a luring mermaid, and is prone to wreck boats. The eye is said by some to have value as a love charm; the teeth are valued medicinally as a cure for toothache; and the meat and grease are taboo in places, but are utilized in others. Bates (Clodd ed., 1892, p. 309) stated that, "No animal in the Amazonas region is the subject of so many fables as the Bouto, but it is probable that these did not originate with the Indians, but with the Portuguese colonists." However, the mysterious life of the cetacean, in which all life processes take place in the water away from the eye of man, plus the boundless exuberance of its activity and obvious social traits, undoubtedly inspired as much awe and friendly feelings among the aborigines as among more civilized groups.

Little or no hunting of the river dolphins takes place now, nor probably ever did, but if so, it is probable that they were taken with harpoon and wooden float, similar to those used for pirarucú fish and river manatee.

Family Ziphiidae, marine porpoises and dolphins: These are captured occasionally, or found stranded and then utilized, along the southern coasts. The genera include *Mesoplodon*, *Ziphius*, *Berardius*, and *Hyperoodon*.

Family Delphinidae, marine and river dolphins: This family includes the pink Amazon River dolphin (*Sotalia pallida*); and other *Sotalia* which are marine, together with *Delphinus*, *Stenella*, *Lissodelphis*, *Lagenorhynchus*, *Cephalorhynchus*, *Phocaena*, *Globicephala*, *Grampus*, *Tursiops*, and *Pseudorca*. Dolphins generally are captured or killed when stranded; occasionally they are taken by harpoon and boat, or net. They are most important to the Chilean and Patagonian Coastal natives.

Family Physeteridae, sperm whales; Balaenopteridae, rorquals and finners; and Balaenidae, bowheads: All are marine and are common mostly in the extreme South and West. They are not captured by any special techniques comparable to those used by the Northwest Coast Indians and *Eskimo* of North America, but when found stranded dead or alive they are eaten enthusiastically, often as a social ceremony by a great gathering of natives (*Chono*, *Yahgan*, *Alacaluf*). The southern bowhead whale (*Eubalaena australis*) apparently was the commonest victim.

Order PROBOSCIDEA: Elephants and Mastodons

All proboscideans are now extinct in Neotropica, but a number of species were common in late Pleistocene and early Recent times, and some were contemporaneous with early man.

Family Gomphotheriidae, mastodons: Three genera of this large family occupied most of South America in late Pliocene, Pleistocene and early Recent times. In Ecuador and Argentina, some species were contemporaneous with early man and were utilized as food, though probably only when accidentally available (crippled individual, Ecuador). (See Cabrera, A., 1929; Simpson, G. G., 1945, p. 132; Sellards, 1940, p. 405.)

Family Elephantidae, mammoths: This family, to which belong the living elephants, probably penetrated into northern South America from North America in post-Pliocene times, and perhaps survived to be contemporaneous with early man. G. G. Simpson (1945, p. 134) stated, however, that the single record of this family in South America (French Guiana) needed confirmation.

Apparently absent from Neotropica are legends of "stiff-legged bears," and proboscis creatures, as well as proboscis figurines, all of which vaguely imply a relatively recent knowledge of living or frozen elephants. Such have been recorded reliably from North America (Elliot Smith, 1915; Strong, 1934; Speck, 1935; Michaelson, 1936), though some other claims, especially those of elephant figurines or drawings, may be spurious.

Order SIRENIA: Manatees

Family Trichechidae, manatee, "peixe-boi" (*Trichechus inunguis*), Amazon and Orinoco Rivers; and sea-cow, "manati" (*T. manatus*, pl. 39), Caribbean and Antillean shores and rivers: Both species are important for food, hide, and fat, and in mythology.

The river manatee, or fish-cow, was the third most important animal of the Amazon-Orinoco River systems, being next in importance to the social river turtle and the giant-scaled fish ("pirarucú"). The manatee was taken by harpoon or net during the dry season or when the water was falling or rising rapidly and creating channels and currents. The hunter quietly made his way by canoe in the pools and channels, careful not to betray his presence to the keen "auditory" sense of the manatee. The harpoon had a detachable head and a float of wood which was sometimes merely the shaft itself. An individual manatee might be several meters long and weigh from 200 to 300 kgs., and would thus supply a large amount of meat, fat, and good hide. The harpoon technique was highly developed in the fluviatile regions of tropical Neotropica, and was used for the manatee, turtle, and the large pirarucú, even on the same hunt in the same pool during the dry season. (See these other species.) Nets were used for manatee in mouths of pools, lakes, or channels, but that these nets or those used to catch turtles (q. v., p. 404) were pre-Columbian is uncertain. (See Morais Rego, 1944; Verissimo, 1895, pp. 48–56.)

The sea-cow of the Caribbean coasts was very similar to the river-cow, and like the sea turtle, was taken by the use of the suckerfish (q. v.).

Order PERISSODACTYLA: Odd-toed Ungulates (Horses, Rhinos, Tapirs)

Family Tapiridae, tapirs, "antas," "dantas" of Guiana-Brazilia (*Tapirus americanus*, syn. *terrestris*, pl. 39) and Central America (*Tapirus*, or *Tapirella*, *bairdi*): The tapir is utilized extensively for meat and hide, and, over much of its range where it commonly occurs, it can be captured with special pit traps, or by boat and lance or harpoon; it is large (200 to 250 kg., or 440 to 550 lbs.)

Family Equidae, horses: Paleontologically and archeologically, horses are known from southern South America, Perú and Ecuador, but these species (*Equus curvidens* and *Hippidium* sp.) became extinct shortly before the arrival of the White man, and were never domesticated by the aborigines, though probably they were utilized for food when and where obtainable (Bird, 1938 b). The European horse (*Equus caballus*) quickly became feral after introduction by the Spaniards, and soon was thoroughly utilized for riding, packing cargo, and for food and hide, especially by the *Tehuelche*, *Puelche*, *Diaguita*, *Araucanians*, and several Chaco tribes of Argentina in the early 18th century, though probably only after the stimulus of observed Spanish use. The *Goajiro* of Venezuela also became horsemen. (See Cabrera, A, 1945, which was received too late for inclusion of its material here.)

Order ARTIODACTYLA: Even-toed Ungulates (Cattle, Deer, Sheep, Goats, etc.)

Economically this is the most important order, and is found over entire Neotropica except the Antilles.

Family Tayassuidae (syn. Dicotylidae), peccaries (pl. 38): These Neotropical wild pigs are common over most of Guiana-Brazilia and Central America; they are secondary endemics. There are two distinct species (often treated as different genera), known collectively as "porco do matto," or "puerco de monte," but they are not to be confused with feral European pigs (*Sus scrofa*), from which they differ by the presence of a lumbar scent gland and the absence of outer dew claws behind (among other characters). Both species of peccaries are utilized extensively for food and hide, and either species would seem to be potentially domesticable because the young tame easily, but unless castrated the males soon become vicious and unmanageable. Darién Indians traded live peccaries with inland tribes (Cieza de León, Markham's ed., 1864, p. 37).

The collared peccary, "caetetú," "saino" (*Tayassu tajacu*), inhabits the forests and brush from the Río de la Plata to the southwestern United States. This species is relatively small (15 to 20 kg., or 30 to 45 lbs.), with an indistinct whitish collar over the shoulders. It is generally solitary, but is also found in small bands of six or eight; it is highly palatable and is prized for food and hide. Collared peccaries are hunted generally by ambush shooting, pits, nets, or by chase with dogs, which drive their prey into hollow logs or the burrows of the giant armadillo.

The second species, the white-lipped peccary, "quexado," "cafuche," "puerco de tropa" (*T. pecari*), is found also in the forests, from southern Guiana-Brazilia to southern México. It is larger (25 to 35 kg., or 50 to 75 lbs.), with a conspicuous white lower jaw; it is sporadically common in large herds, some numbering 200. The species is truculent, noisy, gregarious with communal defense, and is a formidable opponent. As its cruising radius is large, it is not as dependable a source of food as is the collared peccary. It can be captured by pit traps, nets, or by careful stalking from the rear; it is easily detected from a distance as great as a half kilometer because of its noisy progress through the jungle, grunting and squealing, and perhaps sometimes by the claimed perceptible aroma from the lumbar gland. When alarmed it indulges in loud and effectively intimidating tooth chattering and much glandular secretion; its charge is swift but short and often ineffective—though a fallen single enemy, puma, jaguar, or man, is generally doomed.

Remains of *Platygonus*, an extinct genus, have been found in early pre-Columbian graves and middens of Santiago de Estero and the Chaco of Northwest Argentina (Rusconi, 1930).

Family Camelidae llama, alpaca, guanaco, and vicuña (pls. 43, 44); Patagonia-Chilea; secondary endemics: This group is extremely important, and is discussed in detail later (pp. 429–454). The llama and alpaca are found now in a domesticated state only, the guanaco and vicuña in a wild state only; but both the latter were utilized much by the Indians of the Patagonia-Chilea pampas and of the Highlands of Bolivia and Perú.

Family Cervidae, deer, "veado," "venado"; entire Neotropica except Antillea; secondary endemics: This family is very important to the aborigines for food, hide, and implements (bone and horn). The large swamp deer, "cervo," "ciervo" (*Blastoceros dichotomus*), is found on the plains and swamps of southwestern Brazil, eastern Bolivia, and the Chaco. Its range roughly coincides with that of the giant maned fox (*Chrysocyon brachyurus*). The Pampa deer (*Ozotoceros bezoarcticus*) is a smaller deer with a conspicuous white tail-and-rump patch, and it has a wider range over southern Guiana-Brazilia and northern Patagonia-Chilea. The short-legged, single fork-antlered, medium-sized Andean deer (*Hippocamelus bisulcus*) is found on the high puna, páramo, and altiplano of the Andes from Colombia to Tierra del Fuego. The small brocket deer (*Mazama*, several species, pl. 36) is widely distributed throughout the forests of Guiana-Brazilia and Central America. The males have small spike antlers. Finally, the pygmy deer, "corzuelo enano" (*Pudu pudu*), is a rare inhabitant of the High East Andean forests from Colombia to Bolivia. Eaton (1916) found remains of this species in Machu Picchu graves. Deer are hunted everywhere by stalk or ambush.

BIRDS (AVES)

There are 22 orders with 86 families of birds in Neotropica; it is the richest bird fauna in the world and an ornithologist's paradise. Thirty-six percent of the families are primary endemics (Australia has 9.7 percent; Ethiopia, 8.9; others, each under 2; see Barden, 1941;

Wetmore, 1929, p. 548). There are many food, pet, and "feather ornament" birds, and one domesticated species, the Muscovy duck, though several other species have been semidomesticated—the steamer duck, curassow, guan (chachalaca), parrot, trumpeter, etc. (See p. 388.) Only the most important groups and species are discussed here. The turkey is not of Neotropical origin. (See p. 393.)

Food birds are not numerous but some are very important, especially the rheas, tinamous, ducks and geese, curassows, and guans. Pet birds are commoner, however, and include mainly the rheas, screamers, trumpeters, curassows, guans, parrots, parakeets, macaws, toucans, and such songbirds as orioles and thrushes. The use of bird feathers for ornamental body bands, cloaks, or weapon decorations was as highly developed in Neotropica as anywhere else in the world. Feather cloaks of the Brazilian *Tupinamba* Indians and of Central Andean tribes (Coastal as well as Highland) were works of high art, and were greatly prized. Principal "feather ornament" birds are rheas, parrots, macaws, and toucans. (See Yacovleef, 1933 b.) Modification of feather color by the process of "tapirage" was an indigenously developed art and was practiced exclusively (?) on parrots. (See p. 408.)

Order RHEIFORMES: Rheas

These animals are found in southern Guiana-Brazilia and entire Patagonia-Chilea. They are primary endemics, and form a monotypic order with the family Rheidae.

Rheas are entirely flightless, are cursorial, have three toes (ostriches have two), and are typical plains animals. They were important, especially to the Pampa tribes, for food, feather ornaments, and pets; prepared eggshells served as containers. There are two species: the "ema," "ñandu," "avestruz" (*Rhea americana*, pl. 45), of southern Guiana-Brazilia and northern Patagonia-Chilea, which is large (25 to 50 kg., or 50 to 100 lbs.); and the "avestruz" (*Pterocnemia pennata*), of southern Patagonia Chilea, which is smaller (15 to 30 kg., or 30 to 60 lbs.).

Order TINAMIFORMES: Tinamous, "Inhambús," "Jaós," "Perdizes"

This order is found throughout Neotropica except Antillea. (See pl. 42.) It represents an old endemic but successful and widespread stock in the region.

These birds parallel in external form the true quails and partridges (order Galliformes); all are palatable and highly desired for food, and many (all ?) species are solitary. They are hunted by snare or by decoying to ambush by calling, and they can often be called or approached close enough to be killed with a stick or stone. There are indications that the domestication of one or several species was attempted in the Central Andean region (personal interpretation of Latcham, 1922, pp. 176–179; see p. 394).

Order SPHENISCIFORMES: Penguins

These birds are found on the coasts of Patagonia-Chilea; most of them are primary endemics.

There are six Neotropical species of these flightless sea birds. All except one undoubtedly were used for food, especially during the breeding season, when adult birds can be clubbed and the young and eggs gathered by the hundreds. In the winter the birds are so fat that the skins with "blubber" can be burned as fuel. The five species utilized are: King penguin (*Aptenodytes patagonicus*), medium size, Fuegian coast; johnny penguin (*Pygoscelis papua*), smaller, Staten Island; rock-hopper, or tufted penguin (*Eudyptes crestatus*), small, common on Fuegian coasts; Magellanic jackass penguin (*Spheniscus magellanicus*), common on southern coasts; and Peruvian jackass penguin (*Spheniscus humboldti*), common Valparaiso to Lobo de Tierras, Perú. (See Murphy, 1936, 1: 329–371.) The sixth species, the Galápagos penguin (*Spheniscus pendiculus*), was unknown to aboriginal man, who never gained access to these islands, which lie far offshore from Ecuador.

Order PELECANIFORMES: Tropic-birds, Pelicans, Cormorants, etc.

Three members of this order are important as guano birds on the Peruvian Coast in the following sequence of importance: Cormorant, "guanay" (*Phalacrocorax bougainvillii*); booby, "piquero" (*Sula variegata*); and the brown pelican, "alcatraz" (*Pelecanus occidentalis*). These birds nest by the millions on certain small Peruvian islands, where over countless centuries or millennia they have formed huge deposits of guano, composed of excrement and the remains of dead birds. This guano was utilized by the Coastal Peruvian aborigines for fertilizer, and the Inca enacted laws and exercised royal control for conservation purposes. It is presumed that this natural fertilizer had a large role in Peruvian aboriginal agriculture which was highly developed and which Cieza de León said probably would not have been possible without guano (Markham's ed., 1864, p. 266). The exploitation of guano and the birds themselves for food in pre-Columbian times involved marine transportation (by balsa according to Cieza de León, idem, p. 265), and semipermanent camps were located on the guano islands. In the 19th century guano was the principal source of national wealth for the Republic of Perú, and until recently was exploited disastrously without conservation.

Garcilaso de la Vega recounted that,

> On the sea coast from below Arequipa [south] to Tarapaca, a distance of more than two hundred leagues, they use no other manure than the droppings of sea birds, . . . [which] fly in such enormous flocks that it would be incredible to any one who had not seen them. They breed on certain desert islands on the coast, and the quantity of manure they make is also incredible. From a distance these heaps of manure look like peaks of snowy mountains. In the time of the Kings Yncas, such care was taken to preserve these birds, that it was unlawful for any one to land on the islands during the breeding season on pain of death; that the birds might not be disturbed or driven from their nests. Nor was it lawful to kill the birds at any time, either on the islands or elsewhere, also on pain of death.
>
> Each island was, by order of the Ynca, set apart for the use of a particular province, or if the island was large it served for two or three provinces; and marks were set up to let the people of one province know their limits, and to prevent them from encroaching on those of another. More minute divisions were also made, to show the portions set apart for each village, which were again subdivided into portions for each individual, according to the quantity of manure that he would require. The inhabitant of one village was punished with death if he took manure from parts set apart for another; nor was he allowed to take more from within his own limits, than had been settled in accordance with the requirements of his lands. [Garcilaso de la Vega, Markham's ed., 1869, vol. 2, pp. 11–12.]

Strangely, Garcilaso especially mentioned fertilization with guano in the region from Arequipa south to Tarapaca (which is now the most northern province of Chile) while the guano islands of today lie far north, from Chincha north almost to Tumbez. In fact there are no coastal islands south of Vieja Island, Bay of Independencia, near Chincha, until one gets south of Valparaiso. Hence, guano must have been imported in aboriginal times into these southern provinces, and Garcilaso was impressed with this fact, whereas guano was probably more extensively used from Chincha northward. However, in the middle 1800's, the guanay bird appeared to be a minor inhabitant and small contributor of guano on the northern islands and was found in larger numbers south as far as Tarapaca. (See Coker, 1919, pp. 505–510). This condition may have been existent in *Inca* times, and deposits of guano, now exhausted, may have been built up on the rocky headlands and utilized by the local inhabitants.

The accumulation of guano depends upon the presence of millions of the above-mentioned three species of birds, principally the guanay, crowded on small coastal islands, and their large numbers depend upon the nearby presence of millions of small fish, "anchoveta" (*Engraulis ringens*), which in turn depend upon the presence of swarming plankton and other very small marine organisms; and, these in their turn depend upon favorable ocean currents and temperature. Should the currents shift and temperature rise so that the plankton is carried far out to sea, the anchovies go with them, and the guano birds starve by the millions or emigrate; their carcasses cover the Peruvian beaches in windrows for miles. Normal ocean conditions bring plankton and anchovies close enough to shore to be utilized as food by the birds, whose numbers, after such a catastrophic decrease, return to normal. The decreases are believed to be periodic, recurring about every seven years. (See Murphy, 1936, 2: 899–909; Vogt, 1942). Similar conditions with cyclic abundance and decrease, probably existed in aboriginal times and periodically may have affected severely the local economy.

A Pachacamac textile (from near Lima, Perú) suggested to E. Nordenskiöld (1931, p. 4) the possibility of a pre-Columbian trait of fishing with trained cormorants, as is done in the Orient; but this textile has not been similarly interpreted subsequently, nor the trait verified by other evidence.

The king shag or white-breasted cormorant (*Phalacrocorax albiventer*) nests in large colonies on the Fuegian coast, and young birds and eggs formerly were collected by the natives in great numbers for food (Townsend, 1910, pp. 9–10).

The pelican was stated by Markham (his translation of Cieza de León, 1864, p. 24, footnote) to have been a sacred bird on the Island of Puna, Gulf of Guayaquil, Ecuador. Wetmore and Swales (1931, p. 67) remarked that the throat pouch of the pelican was used as a tobacco pouch in Hispaniola—perhaps also a primitive trait.

Order CICONIIFORMES: Herons, Storks, Flamingos

Birds of this order are conspicuous in any fauna, and several main groups are found in South America. The "jabiru" stork (*Mycteria americana*) occurs throughout the Guiana-Brazilia and Central America subregions, and is conspicuous by its huge size (to 1.5 m.), enormous javelinlike bill, striking coloration of white body and jet-black naked neck and head with scarlet lappets, and flocking habits.

Herons ("garcias") are common in places and are noted for their showy white plumage with conspicuous plumes in the breeding season, their long legs, and their slow stalking hunts for small fish and frogs in shallow water.

The flamingo (family Phoenicopteridae, *Phoenicopterus ruber*) is a conspicuous long-necked, long-legged, heronlike bird, of reddish color especially on the wings, and with a peculiarly bent, short bill. It is gregarious in large flocks and is found from the Antilles throughout most of South America, where it generally is known as "ganso do norte." Ignacio de Armas (1888, p. 131) noted that early authors recorded the retention and breeding of flamingos in the houses of Cuban aborigines, and Wetmore and Swales (1931, p. 96) stated that the leg bones of the flamingo were used in Hispaniola for flutes and pipe stems. Great numbers of flamingos gather seasonally in May on the shallow salty lakes of the highlands of Perú and Bolivia, where they present a striking and pleasing spectacle which could not have failed to impress the high aboriginal inhabitants, but no reference to any special ethnozoology connected with the bird has been found for this region.

Order ANSERIFORMES: Ducks, Geese, Screamers

These birds are very important ethnozoologically; one is domesticated, another semidomesticated, and many others are used for food. About 30 species are found in Neotropica; some are annual migrants north from Patagonia-Chilea or south from North America; others are year-round residents. Hunting is by bolas, net, snare, bow and arrow, and firearms. The *Huarpe*, in northwestern Argentina, and several other tribes (Bolivia, Venezuela, Haiti, Panamá) leave gourds on the water to accustom the ducks to their presence, and later place similar gourds over the heads of adroit swimmers, who enter the flocks underwater and pull their victims below the surface by the legs (Nordenskiöld, 1931, p. 43). All ducks and geese molt their flight feathers simultaneously soon after the breeding season. During this short period, they are totally incapable of flight and are easily captured.

The domesticated Muscovy duck (pl. 45) is discussed on pages 460–462.

The flightless steamer duck "pato vapor" (*Tachyeres pteneres*, pl. 46), is semidomesticated for food by the *Alacaluf* of South Chile and kept in pens (Bird, Handbook, vol. 1, p. 64), but it does not breed in captivity. It is a large duck (3 to 4 kg., or 6 to 8 lbs.) with a mottled body, whitish head, blackish belly, and yellow bill, and it is entirely flightless although the wings are not greatly reduced. Progression on the surface is by rapid, powerful, "side-wheel-steamer" strokes of the wings. This flightless species is confused easily with the flying steamer duck (*T. patachonicus*) of the same range along the South Chilean Coast and western Tierra del Fuego. However, the latter species flies as well as "steams," and has a slightly smaller bill and slightly longer wings; also, the downy young are much lighter brown and have a supraoccular white stripe and horn-colored bill (instead of black as in the flightless species). Another flightless species (*T. brachypterus*) is confined to the Falkland Islands, which was uninhabited by primitive man. (See Murphy, 1936, 2: 957–972.)

The kelp duck or goose (*Chloëphaga hybrida*) of South Chile and western Tierra del Fuego is an important food species, and it is hunted much, especially during the breeding season. It is large, and the males are pure white with black bill and yellow feet and the females are brownish black with flesh-colored bill. It prefers offshore kelp beds for feeding, but breeds on rocky islands.

The Andean goose (*Chloëphaga melanoptera*) of the High Andes of

Perú, Bolivia, and Chile, is often tamed as a barnyard fowl today, and probably was utilized similarly in aboriginal times. It appears to be domesticable, but it was never domesticated by any High Andean culture. The situation of this goose and the Muscovy duck parallels that of the *Galea* cavy and the wild ancestor of the domesticated cavy; their ranges do not overlap, and both are apparently domesticable, but only one was so favored. (See pp. 454–460.) The Andean goose is small (3 kg., or 6 lbs.), and its color is pure white except for conspicuous black wing tips.

The barred Magellan goose (*Chloëphaga magellanica*) is an extremely common resident bird of Fuegia and is an upland inhabitant like the Andean goose. It contributed considerably to the food supply of the early white settlers and presumably was also an important food species to the aborigines, at least seasonally when molting and unable to fly. (See Townsend, 1910, p. 7.)

The large tree duck, "irerê," "marreca do Pará," "apaí," (*Dendrocygna viduata*) of entire Guiana-Brazilia, is often tamed today and kept as a semidomesticated barnyard fowl; and similar aboriginal usage is presumed. Flocks of the irerê may remain around the farm or village even with complete liberty and powers to fly—which they may do during the dry season, perhaps to return again with the rains—thus indicating a strong natural commensalistic tendency which is satisfied by the presence of man. This "duck" is the size of a small goose (to 50 cm. in length), with white face and throat contrasting with black head and body and mottled belly. It nests very obscurely on the ground in grass or in trees. Another species, the fulvous tree duck (*D. bicolor*), with cinnamon-colored underparts, is found in northern and southern Guiana-Brazilia, but not in the intervening Amazon region. Both species have closely related populations in Africa, where they are tamed and kept in a highly semidomesticated condition by the natives, especially on the east coast and on Madagascar and the Mauritius Islands. Physical resemblance between the South American and South African populations of these two species is, in fact, so strong, it has been suggested that the South American populations were introduced from Africa as pets with the Negroes in Colonial times; but this explanation does not seem tenable today.

The tree ducks are not truly domesticated because they do not breed in captivity and do not seem to be more than an accidental part of any Neotropical culture. They must be raised from ducklings or from eggs set under hens, practices commonly followed over much of their range. The nests with eggs are usually difficult to find. The Cubans today raise the black-billed tree duck (*D. arborea*), a species exclusively Antillean, in this foster-parent fashion. Schomburgk noted in the last century that the fulvous tree duck was one of the commonest of "domesticated" animals among the Indians of British Guiana. (See Ihering, R., 1940, pp. 405–406; Phillips, 1922, 1: 125–127.)

The screamers are aberrant Anseriformes belonging to the family Anhimidae. The crested screamer (*Chauna torquata*) of Patagonia-Chilea is kept often in a semidomesticated state as a fighting "cock" or sentinal (Hudson, 1920, vol. 2, p. 132). The bird is large (5 kg., or 10 lbs.) with a chickenlike bill, and 1-inch long spurs on the "wrist" or second bend of the wing. These spurs are very effective in combat.

Order FALCONIFORMES: Condors, Buzzards, Hawks, Falcons

This order is found throughout Neotropica.

Although falconry, or the controlled use of any member of the family Falconidae, was unknown in Neotropica, several members of the vulture family Cathartidae were important ethnozoologically.

The huge Andean condor (*Vultur gryphus*, pl. 46) was commonly represented on pre-Columbian pottery in Perú, and was important in mythology and ceremony. Though the bird is a scavenger, it often is also believed to be predatory, and one design on a pot at Chiclín, Perú, shows the bird eating a child. There are tales of the bird's ability to frighten human beings or animals off cliffs to their deaths below. It is large (length, 1 to 1.2 m., or 36 to 44 in.; wingspread, 3 m, or 10 ft.) and is pure black except for conspicuous white wing patches above, and a white fluffy down-feather neck-ruff. The head is black and naked, and the bill has a prominent excrescence. The young is completely black and acquires the white feathers and neck ruff after the second year. The species ranges throughout the entire Andean chain from Colombia to Tierra del Fuego; north of Perú it is rarely or never seen at low altitudes, but in Perú and southward, it often gathers along the beach to scavenge.

The condor is captured by concealment beneath the skin of an animal, by hiding near a dead animal, or by toxics placed in meat bait. A gorged condor scarcely can take wing. The bird, young or adult, is easily tamed and often remains near its captor's residence despite complete freedom to escape. The *Quechua* and *Aymara* considered it a special messenger from the sun god on account of its flight and soaring at incredibly high altitude. An ancient *Inca* dance is said to have required the dancers to affix condor wings to their arms. Recently, therapeutic qualities are attributed to many parts of the condor's anatomy (heart for cardiac trouble, eye for visual defects, etc.). The Indians today sometimes sew or tie the feet of live condors to incisions in the neck of a refractory bull at a bullfight. (See Housse, 1940.)

The king vulture, "urubu rei," "zamuro rey" (*Sarcoramphus papa*), found throughout Central America and Guiana-Brazilia, was commonly used as a motif on pots of some pre-Columbian Panamanian cultures, but the significance is not known. This vulture was exceedingly common in the Mayan codices and evidently was considered as a minor deity with Rabelaisian traits (Tozzer and Allen, 1910, 4: 329–331 and figs.), and this ethnologic trait probably diffused southward to Panamá. Coloration renders this bird very conspicuous. The body is black with sharply demarked white belly and breast and under-wing coverts; the head is naked except for some sparse black plumelike feathers on top; the neck is brilliantly red on the sides and yellow on the front; and the nostrils and the top of the conspicuous caruncle at the base of the upper bill are also yellow. The iris is pure white. The weight of the vulture is from 3.3 to 5 kgs., and its wingspread from 1.7 to 1.9 m.

Notable for its magnificient size, plumage, bearing, and strength is the famous monkey eagle, harpy eagle, "harpia," "pega macaco" (*Harpia harpyja*), which is found sparsely distributed throughout the forests of the Guiana-Brazilia and Central America subregions. The length from head to tail is about a meter, and the prodigious strength of the great talons is well shown by the huge tarsi, which are the size of a child's wrist or larger. A conspicuous frill and crest of feathers appears around the nape of the neck and on the crown of the head.

The prey of this huge eagle is large, namely, sloths, monkeys, and even wild pigs and small deer and calves, and perhaps a human infant occasionally, if credence is to be given stories current in the interior of Brazil. The flight is by rapid wing beats without soaring, carrying the bird deep among the trees and foliage, and the short "stoop" to quarry is as swift and lethal as a bolt of lightning. The imposing size and strength of this king of predators and the terrifying appearance of its erected crest, large narrow beak, and glaring eye when, caged, it confronts live prey, would inevitably give it a special place in the culture of any native group. The young were eagerly sought and were raised in captivity; the feathers, plucked or molted from wings and tail, gave special value to arrows or head bands, and were items of wealth for display or trade. The meat, fat, and even the excrement had special medical value to some tribes of the Xingú and Araguaya Rivers. (See Ihering, R., 1940, pp. 385–386.)

Related and similar in appearance, though slightly smaller, are the crested harpy (*Harpyhaliaetus coronatus*) and the long-tailed harpy (*Morphnus guianensis*). The former is found in extreme southwest Guiana-Brazilia and adjacent Patagonia-Chilea, and the latter is distributed over most of Guiana-Brazilia and Central America.

Conspicuous by its abundance on the campos and llanos of all the Patagonia-Chilea and southern Guiana-Brazilia subregions is the medium-sized, crested "carácará" (*Polyborus plancus*), which scavenges as fearlessly near man as does a vulture and is as predatory as a small hawk.

The small black vulture, "urubu da cidade," "zamuro," "gallinazo" (*Coragyps atratus*) of Guiana-Brazilia and Central America is a conspicuous village and camp scavenger. It seems to have developed semidomestic (commensal, or even symbiotic, but not domesticated) relations with man, which probably date far back into aboriginal times. It is entirely black, with naked head, and is of the size of a raven.

Order GALLIFORMES: Pheasants, Quails

This ethnozoologically important order, which includes the grouse, ptarmigan, true quail, pheasants, peacocks, guinea fowl, and the chicken in other parts of the world, has four Neotropical groups (in three families): the guans and curassows of the endemic family Cracidae, the North American domesticated turkey of the family Meleagrididae (culturally diffused into South America), and the quails (*Colinus*, *Rhynchortyx*, and *Odontophorus*) of the family Phasianidae. *Colinus*, the "bob-white" of North America, is a relatively recent invader (geologically speaking) of South America as far south as Colombia and Venezuela, and has been introduced by Whites into Hispaniola. *Rhynchortyx* is also a recent invader, and is distributed from southern México to northwestern Colombia. *Odontophorus* is found throughout all of the Guiana-Brazilia subregion as well as Central America, and is a well-established Neotropical grouselike species. The phasianid peacock (presumably the Indian bird, *Pavo cristatus*), and the domesticated numidid African guinea fowl (*Numidea meleagris galeata*) have been introduced into Hispaniola in post-Columbian times and subsequently gone wild (Wetmore and Swales, 1931, p. 45). All gallinaceous birds are important to man because of flocking habits and delicious flesh. The entire order in Neotropica is clearly secondary endemic, stemming originally from Nearctica.

Family Cracidae, guans (chachalacas) and curassows: This family is endemic to Guiana-Brazilia and Central America.

The guans, "jacus," "pajuiles," "chachalacas" (genera *Penelope*, *Ortalis*, etc., pl. 46), are flocking grouselike birds of the jungle which are highly prized for food, and are often kept tamed around the house, though they do not breed under these conditions. They are short-winged and long-tailed, and have a bare colored throat, bluish in some species, reddish in others.

The curassows, "mutums," "pavos" (*Crax*, *Mitu*, pl. 46) are large, almost turkey-sized, flocking jungle birds, which are even more highly prized for food than the guans. They also are kept in captivity in a tame state. Both these types of Neotropical gallinaceous birds would seem to be domesticable, but this was never accomplished. Neither breeds easily, if at all, in captivity. Lotsy and Kuiper (1924, p. 277) suggested that some Cracidae might have interbred with chickens to produce a breed of the latter which lays blue eggs. (See below.) However, such fertile hybridism between two families (Cracidae × Phasianidae) seems impossible. The chicken and the peacock (both Phasianidae) and the guinea fowl (Numididae) can be interbred successfully, but the offspring of any possible interfamily cross is sterile (Jull, 1930, p. 327).

Curassows, probably of the Central American species, *Crax globicera*, were introduced into Hispaniola in historic times, but subsequently appear to have become extinct (Wimpffen, Ritter; quoted by Wetmore and Swales, 1931, p. 46).

The turkey (*Meleagris gallopavo*) is not a Neotropical endemic. Its distribution in the wild state is in southern Nearctica (range now greatly reduced), and it was domesticated in or around the Mexican Highlands. However, it was introduced in pre-Columbian times by cultural diffusion into Central America and northern South America to Colombia and Venezuela (Latcham, 1922, p. 175), or as far as Cumana, Venezuela, and Tumbez, northern Perú (Ignacio de Armas, 1888, p. 119). After the Conquest, it was taken to other parts of South America as well as to Europe. The early Spanish term for turkey was "guanajo," presumably derived from Guanajo Island, eastern member of the Ruatan group north of Honduras, where Columbus first saw the domesticated bird in 1502 (Ignacio de Armas, idem). Later, the turkey was called "pavo," but this word also applies to the native wild curassow, and perhaps to the guan, and much care should be exercised to avoid confusion in interpreting "pavo," even with a knowledge of the local avifauna. The Jesuits apparently introduced the turkey into Hispaniola where it became feral, but these wild birds now are thought to be extinct (Wetmore and Swales, 1931, p. 46).

The ocellated turkey (*Agriocharis ocellata*) of Guatemala and Honduras is slightly smaller than *Meleagris*, and it is beautifully spotted and has erect knobs on the naked head. That it was used for food is certain, but there is no indication of aboriginal domestication or special usage except by the adjacent *Maya* (not covered in this account), who considered it important in symbolic writing and mythology. (See Tozzer and Allen, 1910, pp. 326–329.)

The chicken (*Gallus gallus domesticus*) is not a Neotropical endemic; its home is in southeastern Asia. However, it was introduced very early into South America and quickly spread and became established in aboriginal economy. Latcham (1922, pp. 176–179) discussed the occurrence of "gallinas" and "pollos" in Perú before the conquest by

Pizarro in 1532. Nordenskiöld (1922, pp. 9–30) attempted to show by philology that the *Inca* knew of the chicken before Pizarro's arrival in 1532, and called it "hualpa," which name was current throughout most of the eastern Andean area under *Incan* influence.

The first authentic landing of Europeans on the coast of Brazil was near Bahia on April 22, 1500, by Cabral, who brought chickens. Pinzon and Lepe had landed a few months earlier somewhere north of the Amazon River. Unless one accepts the rumored earlier landings by the Portuguese (said to have been as early as 1448), 31 years is the maximum time for this remarkable diffusion of the chicken, but Nordenskiöld clearly showed that extensive trade routes were well established and that the chicken was treated as a special pet. However, if this explanation is unacceptable, the origin of a true chicken in pre-Conquest Perú must be sought in Polynesian transoceanic voyages.

Latcham (idem) described this early chicken as tailless and laying blue eggs. This suggests a species of tinamou (p. 384), which has a short tail and lays blue (or green) eggs of a characteristic porcellaneous texture. However, there actually is a South American chicken, whose breeding origin is unknown, but which is small, rumpless (without tail vertebrae and pygostyle), lays blue eggs, and has a small single comb and lateral tufts of feathers on the neck (Jull, 1927, p. 452, pl. 13). The breed was "discovered" by poultry husbandrists in 1914, and was called Araucana. The only other known rumpless breeds are some bantams from Japan. Lotsy and Kuiper (1924, p. 277) evidently had in mind the Araucana breed of blue-egged chicken when they suggested what still seems an impossible fertile cross between a normal chicken and a curassow (species not named) to account for the blue eggs.

The entire matter needs clarification. The cultural spread of chickens from Brazil to Perú in less than 32 years seems extremely rapid. The occurrence of the Araucana chicken in pre-Conquest Perú means that the breed originated in less than 32 years during its diffusion, because undoubtedly the originally introduced stock was normal. This, and even the presence of chickens in Perú prior to 1532, may be doubted.

An aberrant galliform is the hoatzin, stinking turkey or pheasant, "cigano," "pavo hediondo" (*Opisthocomus hoatzin*)—one of the most conspicuous birds of the flooded jungles of the Amazon and Orinoco drainages. Its size and appearance of a pheasant (length to 30 cm.); its long tail, crested head, and russet speckled color; its flocking habits with heavy flopping in the dense undergrowth and sibilant hiss or raucous croak when disturbed; its peculiar gizzardlike crop, and the fascinating structure in the young of clawed wings with which they climb hand over foot through the trees; an escape mechanism of the young of plunging suddenly from a height headforemost into the water; and its general abundance—all make this species one which should have ethnozoologic importance. However, the meat is strongly musky and unpalatable, which may have prevented the species from becoming integrated firmly into human culture. The hoatzin represents a unique primary endemic stock, found nowhere else in the world, and such are its startling features of structure and behavior that it has been placed at different times in different avian orders.

Order GRUIFORMES: Cranes, Limpkins, Trumpeters, Rails, Seriemas

This composite order of many diverse types of birds, of which the best known are the cranes and rails, is represented in South America by a number of species including the ethnozoologically important trumpeters of the Guiana-Brazilia rain forests and the characteristic seriema of the plains and dry forests of southern Guiana-Brazilia.

The trumpeter, "jacamin" (*Psophia*, pl. 45), of Guiana-Brazilia, is often tamed and "wing-clipped," and kept around the house as a sentinel against prowling predatory animals or man, but apparently the species does not breed in captivity. The bird is of medium size (length about 50 cm., or 20 in.) with long legs and neck and a short but sharp bill, and is a gregarious terrestrial jungle inhabitant. Its color is black except for a conspicuous white or brown back and upper wing coverts. The voice is a loud, ringing cry, as well as a short, penetrating "boom" of a ventriloquous character, and the bird is not inclined toward reticence when disturbed. Its gregarious nature is apparently completely satisfied by the company of barnyard chickens and turkeys.

The "seriema" (*Cariama cristata*) is one of the most characteristic birds of the vast interior plains of Brazil, Paraguay, and adjacent Argentina (the chapadas, campos, cerrados, and llanos). It is a large bird of about the size of a turkey (length to 75 cm.), with rather long legs and neck, finely mottled coloration of gray white, and a small tuft of plumelike feathers around the nostrils. It is often heard or seen as it perches conspicuously on a bush in open country and calls with an extraordinarily ringing and far-reaching voice in the early morning, or as it walks with stately stride through the grass. It, and a near relative, the forest seriema, or "chuña" (*Chunga burmeisteri*), of the forests of northwestern Argentina, are primary endemics derived from an ancient stock. *Chunga* can be easily tamed.

Order CHARADRIIFORMES: Shorebirds, Plovers

These birds are the common shore and marsh species which usually assemble and migrate in the winter in immense flocks. Some of the Neotropical members are migrants from North America; others are resident birds, or migrants within the South American Continent.

The stone curlew, "bucaro" (*Oedicnemus dominicensis*) was noted by Wetmore and Swales (1931, p. 172) as almost exclusively a semidomesticated bird on Hispaniola, where it was kept in patios and walled corrals to rid the premises of insect vermin. Though the birds never became tame enough to handle easily, they did not escape often (rarely being seen in the free wild state), and were said to breed at times in their state of loose captivity. Superstition claimed that the birds called at the change of each hour. A related species is found in northern South America, but seems not to have been semidomesticated there.

The seed snipes (*Attagis*, *Thinocorus*) are partridgelike aberrant plovers which inhabit the uplands of southern South America and the nearby Andes. In winter they gather in large flocks and probably were an important food species. Darwin looked upon the group as the counterpart of the ptarmigan of the boreal zone of the northern hemisphere. (See Townsend, 1910, p. 9; Crawshay, 1907, p. 130 ff.) They crouch rather than run or fly when disturbed at feed, and apparently are then easy to kill.

Order COLUMBIFORMES: Pigeons and Doves

There are many species of this order in Neotropica, but most are small and few seem to have been of more than minor importance as food species. A quaillike ground dove (the blue-headed quail-dove, *Starnoenus cyanocephala*) in Cuba was seen by Columbus, who found it common and noted its capture alive in numbers by the natives, who tamed the captives in a few days and kept them around the house to fatten for food (Ignacio de Armas, 1888, p. 117). The extinct quail-dove (*Oreopeleia larva*) of Puerto Rico (Wetmore and Swales, 1931, p. 209) perhaps disappeared in aboriginal times and partially through the agency of man.

Order CUCULIFORMES: Cuckoos

Several of the commonest birds of South America are the black cuckoo, "anu preto" (*Crotophaga ani*), and the white cuckoo, "anu branco" (*Guira guira*). The latter was recorded by Wetmore (1926, p. 188) in the Chaco of Paraguay as ". . . considered excellent for domestication since . . . [captive birds ?] are said to rid houses of all the creeping and running insects . . . , and . . . probably without basis in fact, that they might learn to imitate words of human speech." Rarely, however, is the anu branco seen tamed and loose around houses in other parts of South America, nor is it generally commensalistic on man to the extent that the black vulture is.

Order PSITTACIFORMES: Parrots, Parakeets, Macaws

These well-known birds are common and conspicuous over all of Neotropica, including the Antilles. Parrots and parakeets are found even on the Argentine Pampas and treeless High Southern Andes, where they nest in burrows in banks and rock crevices. All are conspicuous because of beautiful green coloration, flocking habits, raucous voice, and mimicking (talking) ability, acrobatic behavior at perch, or depredations on agriculture, particularly corn. Some species, especially parrots of the genus *Amazonia*, and some parakeets and macaws, are semidomesticated as colorful talking pets, but none breed readily in captivity. The supply is replenished by raiding nests for fledglings; the young birds are also considered highly palatable. Although these birds in captivity mimic the human voice and speech, in the wild they do not imitate the calls of other birds or animals (Wetmore, 1931, pp. 107–108). This may be a consequence of insufficient repetition in the wild as compared to the endless reiteration necessary to teach a parrot to speak human sounds in captivity. Their longevity is not much more than 20 to 30 years (contrary to general belief), but this enables a pet taken as a fledgling to become practically one of the family.

An ingenious endemic custom, practiced over a large part of South America, is to modify the color of parrots' feathers by rubbing a dye into plucked areas. The new feathers then take on the desired color, which generally is yellow. This process, known as "tapirage," was summarized by Métraux (1944 c). A mixture of frog- or toad-skin secretion and a plant dye (usually the orange or red *Bixa orellana*) is rubbed on freshly plucked areas of parrots by the *Tupinamba* of coastal Brazil, the *Achagua* of eastern Colombia, the *Carib* of Galibis (French Guiana), and the *Mojo* of eastern Bolivia. The plant dye alone is used by the *Bororo* of southwest Brazil, *Mbayá* and *Mocoví* of the Gran Chaco, and the *Macushí* Indians. The fat of fish is rubbed on or fed to parrots by Indians of the Negro, Uaupés, and Aiarí Rivers, by *Cocoma* and *Cambena* of the Solimões River (both groups used piraràra fish), and by the *Puinave* of southeastern Colombia (carajó fish). In all cases the new feathers are yellow, orange, or red. Some sources claimed that the new color persists through several molts, but this is doubtful. The Brazilians call these modified parrots "contrafeitos," or counterfeits, indicating impermanence in the new color.

There are a number of inconsistencies in the accounts of tapirage. It is not absolutely certain that a skin trauma with the application of a dye would change the color of new-growing feathers, though this may be possible. It is doubtful that the skin secretion of a frog or toad or the fat of a fish would have the same effect (the frog's skin secretion is not poisonous to the blood stream when fresh but some are when dried; p. 408). The color of canary bird feathers can be changed to gray by feeding hemp seed, or to red by feeding the seeds of Cayenne pepper. That feeding may be the true procedure of modifying parrots' feathers has been mentioned by other authors also. (See Wassén, 1934 d, p. 622.) Changes from feeding affect all the feathers at molt, but the localized tapiraged feathers may grow between molts.

Order STRIGIFORMES: Owls

Such a striking bird as the owl would seem to have some related ethnozoology, but references are virtually absent. Several genera inhabit Neotropica. The small burrowing owl (*Speotyto cunicularia*), which is common to most of North and South America, was eaten in Uruguay to stimulate the appetite of convalescents (Wetmore, 1926, p. 202). The custom may be of aboriginal origin.

A giant, cave-inhabiting barn owl (*Tyto osteologa*) on Hispaniola became extinct in relatively recent times (Wetmore and Swales, 1931, p. 43), perhaps after the advent of primitive man with his possible disturbance of the owl's cave habitat.

Order CAPRIMULGIFORMES: Oilbirds, Nightjars, "Curiangus"

The oilbird (*Steatornis steatornis*, family Steatornithidae) of northern Guiana-Brazilia is large (40 to 80 cm., or 16 to 18 in., body and tail), reddish-brown with scattered white spots, with a strong hawk-like bill, and is an important source of food and oil. The birds nest in large colonies in caves where the young, which are excessively fat, can be gathered in large quantities. (See Humboldt, Ross ed., 1852, vol. 1, pp. 254–262.)

A bird sacred to the *Incas* (as the quetzal was to the *Maya*, p. 400) was described by Garcilaso,

> . . . besides the red fringe, the sovereign wore another device peculiar to himself, consisting of two wing feathers of a bird called *coraquenque*. . . . The feathers are white with a black patch, and of the size of those of a sparrow-hawk. They were taken one from . . . [each] wing . . . so as to match. I myself saw them worn by the Ynca Sayri Tupac. The birds . . . inhabit the wild region of Vilcanota, thirty-two leagues from . . . Cuzco, in a small lake at the foot of those inaccessible snowy mountains. . . . more than a couple, male and female, are never seen at a time. It is not known whence they come, nor where they breed.
>
> The Ynca wore their feathers because no others, save these two [birds], had ever been seen or heard of in the world, and all other persons, even the prince who was heir to the throne, were forbidden to use them on any account. For it was said that these birds, being alone, resembled the first Yncas who were no more than two, man and wife, come down from heaven. And to preserve the memory of their first parents, they wore, as a principal device, the feathers of these birds, which were looked upon as sacred. . . .
>
> The Ynca wore the feathers above the red fringe. The tips pointed upward, somewhat apart one from the other, while they touched below. To obtain the feathers, the birds were hunted with as much gentleness as possible, and as soon as the feathers were obtained, they were released. On the accession of each Ynca

a new pair of feathers was obtained; for the heir never used the same insignia, as his father . . . [upon death and embalmment] was adorned with the same imperial insignia. [Garcilaso de la Vega, Markham's ed., 1869, pp. 178–180.]

Ignacio de Armas stated that the feathers were long and barred black and white, and came from the wings of the common nightjar or nighthawk *Hydropsalis torquatus*(=*H. climacocerca*, family Caprimulgidae; 1888, pp. 111–112). However, this species is lowland and tropical in distribution and has not two long wing feathers, but two long *tail* feathers, barred dark and light on the basal third, and dark with white internal margin on the remaining distal portion. A nighthawk of the High Andes is *Uropsalis* (two species, *lyra* and *segmentata*), but this genus also has two long tail feathers (instead of long wing feathers) and these are not barred nor white with a black patch, but are dark with white tips, of 75 cm. length (30 in.), and found in males only. No strikingly long-winged nighthawks exist in South America like the showy standard-winged and pennant-winged species of Africa, though a species (*Eleothreptus anomalus*) of southern Brazil, northern Argentina, and Paraguay has certain wing feathers slightly longer than the others.

The original Garcilaso has not been seen, and so the discrepancy between the two translations of Markham and Ignacio de Armas cannot be judged. Nor is it known to what bird the term sparrow-hawk refers in respect to size. Hence, the exact identity of the *Incan* sacred bird, coraquenque, is in doubt, though provisionally it can be considered as *Uropsalis lyra* and/or *U. segmentata*, the Andean fork-tailed nighthawks.

Both Garcilaso and Ignacio de Armas naturally doubted the rarity of the bird. Markham (in his edition of Cieza de León, 1864, pp. 332–333, footnote) stated that Vilcanota was a river which flowed from high mountains through the valley of Yucay or Vilca-mayna, near Cuzco, where the Incas built a favorite vacation residence.

Order MICROPODIFORMES: Hummingbirds (suborder Trochili), Swifts (suborder Micropodi)

The hummingbirds are conspicuous and important only through their esthetic appeal as unusually colored midgets of striking form and flying (hovering) ability. Some are relatively large, up to 15 to 20 cm. (6 to 8 in.) long including body and tail; others are smaller than the largest insects. The colors, of many shades and hues, are often iridescent.

The swifts in Neotropica are unimportant; there is none with an edible nest made of saliva as in Malaysia.

Order PICIFORMES: Toucans, Woodpeckers, etc.

Family Ramphastidae, toucans: These birds are found in Guiana-Brazilia and Central America; they are primary endemics.

Toucans are important in ethnozoology because of their brightly colored plumage. The feathers, particularly yellow ones, are highly prized for feather bands and ornaments. The birds are characterized by an enormous, falcate, cancellous bill.

Order PASSERIFORMES: "Perching" Birds, "Song" Birds

Birds of this, the largest avian order, are utilized mainly as song pets and for their feathers. They include in Neotropica such conspicuous species as the cock-of-the-rock (*Rupicola rupicola*) of northwest Guiana-Brazilia; oropéndolas and orioles of Guiana-Brazilia and Central America (some with prized yellow feathers); ovenbirds (*Furnarius rufus*) with conspicuous mud nests, of southern Guiana-Brazilia and northern Patagonia-Chilea; and trogons, including the famous quetzal (*Pharomacrus mocino*), of Central America and of *Mayan* culture. Many others are inconspicuous, and are unimportant here.

REPTILES (REPTILIA)

This class has many representatives in Neotropica, and some are important sources of food. The fossil record shows that some groups have had a Tertiary geologic history similar to that of the mammals, as either primary endemics or as secondary endemics and unmodified intrusives from Nearctica since Pliocene times. The nonfossil groups may be presumed to have had a similar history. (See Dunn, 1931; Simpson, G. G., 1943.)

The class includes: (1) Turtles and tortoises, (2) *Caiman* crocodilians and true crocodiles, (3) lizards, and (4) snakes. (See Ditmars, 1928; Santos, E., 1942.)

Order CHELONIA: Tortoises and Turtles

Tortoises and turtles are important as food, both flesh and eggs being edible; and the carapace is useful as a container or percussion instrument.

The commonest land tortoise is the "jaboti," or "galapago" (*Testudo tabulata*, pl. 47), of Guiana-Brazilia. It is found on the forest floor in nonfloodable jungles, is easily captured, and the flesh is eaten. The size is small to medium (25 to 45 cm., or 10 to 18 inches, 3 to 15 kg., or 6 to 30 lbs.). Exceptional individuals attain a length of 70 cm. (27 in.; Ihering, R. v., 1934, p. 112).

Perhaps no ethnozoologic activity on the Amazon-Orinoco drainages was more important than that directed toward the harvest of the socially spawning river turtle (*Podocnemis expansa*), known as "cattle of the Amazon" (as is also the river manatee to a lesser extent). The wide range, the former incredible multitudes assembled for spawning at certain sand beaches, and the consequently wide and easy availability of the eggs, newly hatched young, and adult females, made this species literally a staff of life and a key organism in the fluviatile aspects of the tropical forest biota. Not only man relied heartily on this turtle for food, but also other predators, such as the many aquatic and rapacious birds, predaceous fish, carnivorous mammals, and caymans. No other animal of the Tropics of South America has elicited such lengthy and extravagant prose as this species, and with good reason. (See Bates, H. W., H. Clodd ed., 1892, pp. 300–315; Verissimo, 1895, pp. 56–88; Silva Coutinho, *in* Goeldi, 1906, pp. 733–745; and Humboldt, Ross ed., 1852,2: 185–193.)

In the season when the water is lowest (September on the upper Amazon to November on the lower, and March on the Orinoco), the adult females come to the channels and rivers of this vast inland water system from the flooded forest and marginal pools where they have fattened on vegetable food in the rainy season, and begin their ascent (arribacão) to favored sand bars or beaches to oviposit. The smaller males and the young stay behind. A few females become many, and the many become multitudes by the time of arrival at the spawning area. There this army of reptiles, in a low and constant roaring undertone of colliding, scraping, and moving shells and feet, mills about, satisfying itself individually and collectively that no danger is present on the sand. At least once in the next two weeks or so each turtle emerges at night, goes to the highest parts of the sandy area, digs a hole about ½ to 1 meter in depth and in the bottom deposits 100 to 150 eggs before filling in and tamping down the sand and crawling back to the water in the early dawn.

The factors in the selection of a suitable spawning sand bar or beach ("praia," "playa") are not known for certain, but those favorable include a fine texture of the sand, good elevation of the highest point of the sandy area above annual high-water mark, large extent of the sand bar, and the absence of enemies. The turtles are very wary, as anyone knows who has hunted them. Their vision is extremely acute and perhaps their hearing is not much less so. If predators continually disturb the reconnoitering or laying turtles, the great shoal is said to move to a quieter place. The tropistic behavior of moving upstream against the current on the lower Amazon seems to be reversed on the upper waters where, on the Ucayali River in Perú at least, the annual movement is downstream.

The eggs hatch in about a month of warm sunshine and some rain, and the tiny baby turtles, with umbilicus attached, chew and scratch their way out of the sand and unerringly hasten for the river bank over the sand, sometimes a mile away. The postnatal exodus generally starts at night, but the next day many may be exposed on the sand to predators when still short of their goal. By the advent of the rainy season in earnest several months later, most of the large and small turtles have dispersed to the small rivers, and channels and pools in the forest.

Predation on the turtles is constant throughout the year and in all places of occurrence, but is concentrated on the adults when they spawn, on the eggs in the nest, and on the newborn young just as they hatch and leave the nest to emigrate to water. Despite nocturnal oviposition, hatching, and dispersal of young, the toll is enormous. Jaguars and man are the principal enemies of the adult females during oviposition; man perhaps is the only enemies, though a severe one, of the eggs; but a multitude of predaceous mammals, birds, and reptiles prey on the young during their dispersal on land and shortly afterward in the water when they are still concentrated. At other times of the year, in the forest pools and channels of the main currents of water, the young and old are the occasional victims of fish, bird, cayman, snake, and man.

Human activities centering around the river turtles were many, but were most intense during the short spawning season when a concentration of turtles made for a concentration of humans. While spawning, the adult turtles were harvested by turning them on the back ("viracão"), and later sewing the flippers of one side together to immobilize the victims; they could then be transported for long distances or kept fresh for a period, while others were rendered into dried meat and oil. Hundreds of thousands of eggs were dug up and piled on the ground in front of the individual tents. They were eaten fresh or were rendered into oil by crushing them with the bare feet in a canoe, allowing them to stand in the hot sun for some hours, and then skimming the supernatant into clay or copper kettles for further refinement. In Colonial days, good oil was used for cooking, bad oil for mixing with tar (asphalt) in calking ships.

It is obvious that such harvest methods were very wasteful. Such was the toll taken of adult "pregnant" female turtles during spawning, and such was the disturbance of oviposition to the point of abandonment of the beaches by the turtles in the more heavily settled districts of the lower Amazon in early Colonial times, that turtles rapidly decreased and today no large-scale spawning occurs there, but is confined to the more remote headwaters of both the Amazon and Orinoco Rivers.

However, the possibilities for conservation were so obvious with this socially spawning turtle that certain measures were adopted by some 19th-century Colonial villages on the upper Amazon, and similarly might have been practiced by some aboriginal groups, though Humboldt indicated that such measures were the result of missionary organization of Indian activities. A village appointed a "commandante" to oversee the spawning and harvest activities. He in turn appointed sentinels to furtively watch the turtles in order to determine when oviposition was completed, and to prevent intruders, both human and animal, from frightening the turtles to another locality. During the several weeks of actual spawning, the turtles were completely unmolested, though some wandering individuals were captured by the sentinels for use as fresh food or to make dried meat. After the turtles had layed their eggs and disappeared, the village assembled at the beach, where each family was assigned its own particular space to dig and collect eggs, and all went to work on the harvest in the spirit of a festival.

It is doubtful that the allocation of sections of beach to individual families was as highly organized in aboriginal times as after the white man arrived. The latter had an economic interest in selling the oil and a stronger concept of private property, which might have overcome pure communal participation and harvest. However, the aborigines may have practiced nonmolestation of the turtles, and later segregation on the beach for egg gathering between groups larger than the family, e. g., villages and tribes.

In Colonial times and where conservation was practiced, community ownership of turtle beaches was an important part of the ethnozoology of this species, as was the care taken to allow the turtles to breed continually on the same island without disturbance. In aboriginal times, while the ownership of beaches might have been as important, unconcern or inability to organize the protection of the beach from human or animal intruders might have caused the constant shifting of egg beaches from one place to another, with the result that the spawning locality was never inflexibly associated with a settled mode of existence for a human social group. The sharp and short seasonal concentration of the turtles at spawning might even have caused some tolerance of antagonistic social groups for each other. It certainly caused regular migrations among some aboriginal tribes, who traveled a hundred kilometers or more to partake of the harvest and then returned. Humboldt related how many Indians of the Orinoco, above the falls at Maipures, journeyed to the three famous turtle beaches many miles downstream between the falls and the Apure River. Survival values thus may have brought together from afar human groups and made for special social intercourse between otherwise antagonistic or noncontacting social groups.

Concentrated on the ascent up river (arribacão) to spawn, turtles were hunted by a special technique with a special bow and arrow. The bow was stronger and the arrow longer and heavier than usual, with a sharp iron point which in pre-Columbian times might have been of stone. It was secured to a detachable head by a line wound around the shaft which acted as a float. The arrow was fired with great trajectory to arch and fall almost vertically on the back of a turtle thereby piercing the shell. Close range shooting at an angle was said to result in deflection of the arrow off the dorsal carapace. A turtle was hauled in with the floating shaft and cord and harpooned with a short gaffing harpoon before it was lifted into the boat; otherwise the weight and struggles of the turtle might disengage the arrow head, and the prey be lost. This unusual method of arrow shooting was undoubtedly used when the turtles were massed on the surface toward the end of their arribacão, or perhaps in front of their spawning beach, as the figure by Marcoy shows (see Handbook, vol. 3, p. 634). Under these conditions a failure to hit in the packed group of turtles would be difficult, but it would hardly seem necessary to shoot many at this time because shortly afterward the turtles would expose themselves to capture by hand on the spawning beach, unless the hunters belonged to a group excluded from the beach. The same bow and arrow technique was claimed also for more scattered turtles during the arribacão, when it should be more logical to hunt them thus, but when it also seems incredible that the method would have the requisite accuracy because the target was a single turtle which might not remain on the surface very long.

During the rest of the year, mostly the rainy season, the socially spawning turtles are scattered throughout the flooded pools and channels of the forest and the side courses and swamps of the rivers. Other and smaller species are present also, and these, with the males and young of the socially spawning species, inhabit the permanent pools and water courses in the dry season. In all these places and at all seasons, but particularly in the dry season when water and turtles are concentrated, all species are hunted by man with special harpoon, net, or barbless hook. That the net may be post-Columbian is indicated by the positive preference of the Indians of the Solimões to shoot turtles with bow and arrow rather than use an European net which was brought to the same pool on the same fishing trip and was more productive (Bates, H. W., 1892).

The harpoon used to take turtles in the pools and channels during the dry season was the same as that used to take manatee and pirarucú fish at the same place and time. This harpoon was a long-handled spear with detachable head, and the head was tied to a float of wood or to the shaft for the purpose of recovery. The barbless hook technique of taking turtles involved careful paddling in a canoe in clear water in forest pools where bubbles emitted from the nostrils of a submerged turtle guided the fisherman so he could drop the baited hook directly in front of the victim. Steady traction on the line prevented a hooked turtle from falling off while being hauled into the canoe, and release of traction then allowed it to fall off the hook without any effort of the fisherman. Diving for turtles was also practiced; it doubtless took a good deal of skill and could be practiced only in pools of very clear water.

Nets were firmly set in narrow entrances to pools and channels; but in shallow and muddy pools where no snagging on submerged trunks and branches would take place, the nets were partially dragged and held by wading men while other waders drove the victims toward the net. With the turtles also were taken occasionally snakes, caymans, and fish. The dangerous species were usually treated with contempt, though sometimes with respect, depending on the circumstances. Many of the turtles taken by net were males, and in some places a taboo prevented sick people with inflammation from eating of the flesh (Bates, H. W., 1892).

Attempts to domesticate the socially spawning turtle never got beyond the stage of enclosing captive turtles (probably of several species) in a pool and feeding them with mandioca and leguminous plants, and in certain cases, enclosing the turtles in a small pool surrounded with palisades (Martin, *in* Goeldi, 1906, p. 744; Latcham, 1922, p. 159, 161).

The turtle with the socially spawning habit is apparently the single species, "tartaruga," "yurara-assu" (*Podocnemis expansa*), with range throughout the Amazon and Orinoco drainages. Its size is ½ to 1 m. for adult females with weight from 10 to 50 kgs. Males are smaller, as also are several other common species of which the two principal are the "tracaja" and the "aiyussa." These latter spawn individually or in small groups. All the fresh-water species are collectively and properly known in Brazil as "cágados"; the term "tartaruga" more properly applies to the large marine turtles, but is used commonly also for *P. extensa.*

Order CROCODILIA: Crocodiles, Caymans, Alligators, Gavials

The common crocodilians of Guiana-Brazilia are technically known as caymans ("jacare," "caiman," *Caiman*), and they are represented by five species. Most are small (1.5 to 2 m., or 4 to 7 feet), but one species (*C. niger*) is huge (4 to 6 m., or 12 to 20 feet) and is a formidable antagonist and dangerous predator. The tail, cheek muscles, and eggs are eaten, but are not important sources of food. Garcilaso (Markman's ed., 1869, 2: 23) stated that the Incas received from the Curacas of the coast, gifts of alligators which were 25 to 30 feet long. No alligators are known from this region, and caymans of such length do not occur on the coast of Perú, nor do salt water crocodiles exist in Neotropica as in the Indian-Malaysian region. But large caymans are found in the lowlands east of Perú and may have been captured there and brought to the Highlands. Individuals can be taken when traversing land between bodies of water, especially in the dry season, or when they become concentrated in numbers in drying pools of the llanos. The capture and transportation of a 25-foot monster would require a high degree of skill and perseverence; capture probably was done by lasso.

Four species of true crocodiles, three of moderate size, exist along the Caribbean coast of Guiana-Brazilia and Central America. One species (*Crocodylus intermedius*) is said to attain a length of 6 or 8 m. (19 or 25 ft.), and to constitute a serious menace to human life on the Orinoco River and its tributaries. True crocodiles seem to be more aggressive and vicious than caymans. No alligator is found in Neotropica (the single New World species, *Alligator mississipiensis*, ranges from Texas to North Carolina).

Order LACERTILIA: Lizards

Lizards are represented in Neotropica by many species, of which most are small. Two genera, however, are large and important as food.

The "tejús," or "carípiaris" (*Tupinambis*, pl. 42), of Guiana-Brazilia, are large (length, 1 m., or 39 in., of which the tail is 60 cm., or 24 in.; weight 1 to 1.5 kg., or 2 to 4 lbs.), and generally are common in woods and brush. They are captured by snare or bow and arrow, and eaten.

The "camelões," "sinumbús," or "iguanas" (*Iguana*), of northern Guiana-Brazilia, Central America, and Antillea, are large (length, 1–1.3 m., or 3 to 4 ft., of which the tail is 80 to 90 cm., or 30 to 36 in.; weight, 1 to 2 kg., or 2 to 4 lbs.), and are common but are also arboreal and hence more difficult than the tejú to capture. They are prized for food (the eggs also are eaten), and are hunted with snare or bow and arrow. Individuals are said to be captured alive by certain Guiana-Brazilia Indians and tethered to a stake by a line tied to the neck or passed through the neck plates (Latcham, 1922, pp. 161–162). A similar trait existed on the Antilles when visited by Oviedo in the early 1500's (Oviedo y Valdés, 1851, 1: 392–396).

Order OPHIDIA: Snakes

Snakes are important only in the terrifying aspect and lethal venom of the poisonous varieties, and in the size and the crushing ability of the water boas (anacondas). None is eaten habitually.

The poisonous snakes are found mostly in Guiana-Brazilia and Central America. The "fer-de-lances," and "jararacas" (*Bothrops*, many species) are highly poisonous and common in some places in the jungle and extend out on the Pampas of Argentina. The rattlesnake, or "cascavel" (*Crotalus durissus*), is also highly poisonous, and inhabits brush, dry woods, and plains, but it is rarely common. The bushmaster, "surucucú," or "riéka," etc. (*Lachesis muta*), is large (about 3 m., 10 ft.; and 5 kg., 11 lbs.), and is the most dangerous of all because of its size, force of strike, length of fang, and quantity of venom. It is not abundant over most of its range. The coral snakes, "corales" (*Micrurus*, several species) are small and of less danger or importance than the others mentioned.

There are many species of nonpoisonous snakes, but only the boas and water boas (anacondas) are important.

The boas (principally *Constrictor*), "giboias," of Neotropica except Patagonia-Chilea, are large (to 4 or 5 m., and 20 kg. or more), but are not dangerous. The skin of some species is beautifully colored and patterned and makes a desired trophy and adornment.

The water boa, anaconda, "sucuri" (*Eunectes*, pl. 12), of Guiana-Brazilia is tremendous in size (about 5 to 11.5 m., 11 to 37 ft. (Dunn, 1944, p. 183); and 25 to 150 kg., 55 to 330 lbs.). It is a powerful constrictor and an impressive animal, but probably is of little danger to man. It feeds principally on caymans. Perhaps the serpent motif in the art of the High Andean region stems from the anaconda, which is relatively common in adjacent northeastern Bolivian and eastern Peruvian lowlands, especially in the vast swamps of the Llanos de los Mojos. (See Garcilaso de la Vega, Markhams ed., 1869, 1: 330.) These large serpents were called Amaru, and, without exaggeration, were stated to be 25 or 30 feet in length. Some were presented to the Inca each year, and were kept in a zoo (ibid., 2: 23). Capture of large anacondas can be accomplished in areas where winter cold temperatures render the animal torpid.

AMPHIBIANS (AMPHIBIA)

This class includes burrowing caecilians, newts and salamanders, and frogs and toads. The latter are of importance in Neotropical ethnozoology, and are a common element of art, mythology, magic, poison, and ceremony. (See Wassén, 1934, c and d.)

Order SALIENTIA: Frogs and Toads (Anurans)

The giant toad, "sapão," or "sapo" (*Bufo marinus*), of Guiana-Brazilia, is large (to 2 kg., or 5 lbs.), with huge external parotoid glands on the rear sides of the head and neck. These glands contain a milky secretion, which is expelled in droplets when the toad is frightened or in streams when pressure is applied, and which is toxic to the digestive tract. This secretion, as well as that from the skin of this and other species (particularly *Dendrobates*), is said to be used as an ingredient in "tapirage" to change the color of growing feathers of parrots. (See p. 397.)

The small and brilliantly colored poisonous frogs, "ranas de veneno" (*Dendrobates* and *Phyllobates*), of northwestern Colombia, have a skin secretion which appears to be highly toxic to the digestive tract though harmless to the blood stream when fresh, and to have the opposite effects when dried. In the dried condition, it is used as a poison for blowgun darts. (See Wassén, 1934 c; many authors have written on this subject, and a summary with critical herpetological notes is being prepared for publication by E. R. Dunn, who has kindly supplied some of the data given above.)

FISHES (PISCES)

Neotropica is rich in fish life, both fresh-water and marine, and many species are important food items. Of the many fresh-water species, the most important as food are the unarmored (leather) catfishes, the huge, scaly "pirarucú," the "dourado," the sábalo, and the small "ispé" of Lake Titicaca. Important for other reasons are the electric eel, the sting ray, the cannibal fishes, and the candirú. (See Eigenmann and Allen, 1942; Couto de Magalhães, A., 1931.)

Order HYPOTREMATA

The fresh-water sting rays, "araias," or "rayas" (*Potamotrygon, Paratrygon*), of the Amazon and Orinoco Rivers, are roundish and about 1 m. (3 ft.) long, of which half is a whip tail with a spine near the center on the dorsal surface. The spine is grooved for secreting poison into a wound after the victim has been struck. The rays often lie concealed in sand and mud at the edges of shallow water, and from this position are capable of inflicting a severe wound on the foot of a wading person, sometimes producing dangerous necrosis of tissue. They are greatly feared by wading boatmen and fishermen, as well as bathers. The spines are utilized for weapon points.

Order NEMATOGNATHI

The unarmored catfishes (family Pimelodidae), especially the "laulau" of the Orinoco, or "pirahýba" of the Amazon (both, *Brachyplatystoma filamentosa*), are large (length, 1 to 4 m., or 3 to 13 ft; weight, 50–400 kg. or so), with huge mouths where the eggs are incubated and where the young take refuge (oral gestation, buccal incubation). These fish are said to swallow swimmers and are much feared. This is possible with large fish and small persons, but its occurrence is certainly rare. The flesh of this fish is delicious. Capture is with baited hook on the bottom, or more rarely with harpoon on the surface. The "sorubím," or "pintado" (*Platystoma*), of eastern Brazil, is similar to the pirahýba. The "jahú," or "mangurú" (*Paulicea lutkeni*), of the Río de la Plata and the Paraná River to the Madeira River, is perhaps larger than the pirahýba. (See Gudger, 1943.)

The "candirus" (family Pygidiidae, genera *Vandellia*, *Stegophilus*, *Acanthopoma*), of the Amazon and Paraguay drainages (and Paraná?), are very small fish (3 to 5 cm., or 1 to 2 in.), slim, transparent, and with hooks on mouth and gill covers (but no dorsal fin with spines). These midgets are scavengers and ectoparasites on fish, and also endoparasites in the gills and body cavity or cloaca of larger species, especially catfishes. Sometimes they swarm around bathers and inflict scratches deep enough to draw blood. Rarely a candiru enters, as an accidental endoparasite, the vagina or urethra of an unprotected bather, but such rare cases have been responsible for widespread fear of the fish, and belief in associated urinophilism. (See Gudger, 1930.)

Order PERCESOCES (PERCOMORPHI)

The famous mullet "tainha," "lisa" (*Mugil*) is a delicious oily fish with extraordinary habits and attributes. The striped or gray mullet (*M. cephalus*) is the commonest species, and is almost cosmopolitan over the tropical and temperate parts of the world. It grows to about a meter but averages half this or less. The meat can be cooked in its own oil; but more important to man is the character of the fish of schooling in immense numbers along the coast, or in estuaries, bays, and even rivers—from salt through brackish to fresh waters. These schools may number millions, and they generally include one size of fish because schooling starts early in life. The fish is generally difficult to catch: it is a vegetarian and will not readily take a hook, it is a great jumper and tends to leap over nets, and it will not lead easily into weir traps. However, by special techniques with nets and weir fences, aided by torches, percussion instruments, and the tide, large numbers can be taken, especially in the annual autumn runs for feeding or spawning along the coast or in brakish water. The species has been found as far south as southern Brazil on the east coast, or to Chile in the west, but perhaps was most sought in the Caribbean and off Brazil. (See Verissimo, 1895, pp. 96–99; R. Ihering, 1940, pp. 752–775.)

Ignacio de Armas (1888, p. 154) recorded Sebastian de Campo as noting in 1508 in Cuba the presence of many weirs of cane in which were kept and bred millions of mullet for human consumption. This cultivation or semidomestication of the mullet has apparently not been recorded elsewhere in Neotropica, but is possible, as such fish farms for gray mullet existed in Italy at a later date.

The rainy season in Neotropica may be so heavy that many closed coastal lagoons are opened annually to the sea by fresh-water action and then become tidal or seasonal pools where mullets enter in great numbers. This peculiar tropical marine ecology attracts shrimps also and thereby supplies much seasonal food of great richness and variety to the inhabitants of the region (R. O. Smith, *in verbis*).

A mulletlike fish and a smelt exist in large numbers along the coast of Tierra del Fuego (Townsend, 1910, p. 13), and may have been netted by the natives, who utilized dogs to help in driving the fish into nets (Gudger, 1923, p. 566–567, quoting Byron and Fitzroy).

Order GYMNOTI

The electric eel, "puraque," or "temblador" (*Electrophorus electricus*), of the Amazon and Orinoco drainages, is large (to 2.3 m., or 9 ft.; average 1 to 1.5 m., or 3 to 5 ft.), and is capable of emitting rapidly pulsating electric shocks up to 500 volts (average 300) lasting only 2/1000 second, at frequencies of 400 per second, and with an average wattage of 40. This discharge can upset a horse or render unconscious a man in the water, and the eel is greatly feared by swimmers, bathers, and wading fishermen. Palatability of the flesh is claimed by some to be good, but by others bad. Electrotherapy with the electric eel was practiced by the Indians of Surinam, probably with individual eels weakened by exposure, starvation, or continual stimulation (which can be done). The flesh is said to be eaten in Brazil as a cure for rheumatism. The eel apparently breeds in shallow clear water on inundated lands in the rainy season. The electric organs lie in the posterior three-fifths of the body, and are analogous to a storage battery. The current passes from head to tail. The eyes are apparently useless because of cataracts, which may be the result of a fish's own electric discharges or of those of its neighbors. The eel hunts by underwater "radar," which is effected by short impulses of about 50 volts at frequencies of 50 per second; these rebound from the prey and are received by a series of specialized pits on the head. Coates (1947, p. 79, from which most of this data is taken) doubted strongly the famous story of Humboldt that the Indians of the Orinoco drove horses into concentrations of electric eels to exhaust their electricity before catching them with impunity. Coates found captive eels able to emit electricity all day, and they needed only 5 minutes to completely recover from 20 minutes of heavy discharge. The eels of Humboldt's story, however, may have been injured or exhausted by the horses. The Indians caught them also with dry-handled spears, or arrows attached to dry lines, when the eels came to the surface, as they do occasionally, to gulp air. (See also Coates, 1939; Coates, Cox, and Granath, 1937; and Cox, 1938, p. 59; Humboldt, Ross ed., 1852, 2:112–128.)

Order ISOSPONDYLI

The "pirarucú" (*Arapaima gigas*, pl. 47) is found in the Amazon and Orinoco Rivers (and Río de la Plata ?). It is a large fish (lengths to 3 m., or 10 ft; weight, 100 kg., or 225 lbs.), large-scaled, with a small head and caudal fin, and of pinkish color. The flesh is tasty and often is dried (sometimes salted like codfish of the northern hemisphere). The bony tongue (hyoid bone) is covered with denticles and is used as a rasp or file.

The most important fishery of the Amazon has been that of the pirarucú, which, with the turtle, furnished the greater part of the meat supply of this region to the early inhabitants. The harpoon technique was almost universal and was practiced in the following manners: (1) From a boat in the clear and shallow water of pools or channels in the dry season when depths were not excessive and muddiness was at a minimum, and the fish could be seen and harpooned under water; (2) from a boat in clear or muddy water when the fish arose to the surface to gulp air as it generally did every 10 minutes or so; (3) from a boat when the fish were spawning and less conscious of danger, as well as surfacing more often in the same place, so that harpooning was easy; and (4) from foot when wading in shallow pools beating the water with a club in one hand and harpooning from the other.

The huge fish was also taken with hook and line, sometimes on many hooks set and baited at night on a trotline stretched across a stream or river, or with a single hook, secured solidly to the bank or to a flexible pole. Nets were rarely used because the fish were too destructive.

Wading the shallow pools entailed a certain amount of annoyance, from caymans, electric eels, and large water boas (anaconda snakes), as well as piranha fish, but all these dangers have usually been vastly overrated by narrators, though they were always a possible source of accident. The native of the flooded forests and vast inland waterways adjusted himself well to the dangers and realized their potentialities, most of which he held in contempt as well as respect, like a man working constantly with explosives. Familiarity bred contempt, but the contempt was bred of the knowledge derived from familiarity.

The harpoon was a heavy, strong weapon with an iron point of about 10 cm. on the head, which was detachable from the handle, though secured to the handle or a special wooden float by a cord. The same harpoon was used for the manatee and the turtle.

The peculiarities of the fish of coming to the surface quite regularly to gulp air lent itself admirably to the fishing technique with harpoon. Some of these surfacings ("boiares") of the pirarucú might be violent breachings of the whole body as if in fright from the shadow of the boat, or from a predator, or even in play; or they might be a gentle breaking of the surface, marked only by a concentric circle of ripples; but the descent and plunge to depths was marked by a trail of bubbles, some the size of a lime, and in clear water the fisherman could trace the course of the fish and harpoon it under water. The ease of capture when spawning was a feature which lent itself to reckless exploitation; wise conservation by restraint at this time was not known among the aboriginal or civilized groups. The time of fishing was usually during the dry season, when the flesh could be easily dried and the water was low enough to concentrate the fish in surviving pools and decrease the depth and facilitate harpooning. The flesh of the pirarucú in large quantities was a commercial protein staple of the region. Today the supply has declined as a result of overfishing. (See Verissimo, 1895, pp. 28–48; Higbee, 1945, p. 415; Couto de Magalhães, 1931, pp. 172–176).

At least four species of Holarctic salmons and trouts (family Salmonidae) have been introduced recently into the mountains of southern Chile and Argentina (lake region), Bolivia (Cochabamba, and Lake Titicaca), Perú (Junín), and Venezuela (Mérida). They are the salmon (*Salmo salar*), the rainbow trout (*S. gairdnerii*, syn. *S. irideus*), the brook trout (*Salvelinus fontinalis*), and the lake trout (*Cristivomer namaycush*). These species have thriven so well that they now afford food to native populations and sport to sportsmen. Probably they will assume a greater role in each respect as their introductions are extended further in high-altitude or high-latitude streams and lakes, where other common, cheap sources of protein food are scarce, and where they easily establish themselves in the absence of effective competition from native species.

Order CYPRINODONTES (MICROCYPRINI)

The most important of the cosmopolitan tropical and temperate killifishes (family Cyprinodontidae), from the viewpoint of native utilization in South America, are the orestines (*Orestias*, many species, "ispé," "killuncho," "carache") in Lake Titicaca and adjacent waters. These small fish rarely grow larger than about 30 cm. (10 in.), but some species are so plentiful, especially in the immature stage, that great numbers of tiny fish are netted, dried, and eaten entire, raw or roasted. They are also placed in wine, to which they contribute a distinctive flavor and perhaps some proteins and vitamins producing a tonic effect. This group of fishes, with a small catfish, supplies the only native piscine food of the heavily populated altiplano of Perú and Bolivia, and their presence and availability may have favored the early human settlement of this region, which later became famous as the seat of the High *Aymara* and *Quechua* cultures and great populations. Recently other fishes have been introduced into Lake Titicaca. The Orestiinae also inhabit the lakes, rivers, and streams of nearby highland Bolivia and Perú (Lago Junín, Upper Rimac, Ramis, and Urubamba Rivers, Lago Poopó, etc.). (See Garman, 1875, and Tchernavin, 1944.) Coker (1923) discussed the ingenious weirs and nets in use by the *Aymara* of Lake Titicaca.

Order HETEROGNATHI

The "dourados" or "pirajás" (*Salminus* sp., pl. 41) superficially resemble the salmons of the Northern Hemisphere in their golden color and in form, but belong to a different family (Characinidae), and occur in the upper drainages of the Orinoco, Amazon, and La Plata. They are large fish (length, to 1 m., or 1 yd.; weight, 50 kg., or 110 lbs.), with tasty flesh and large roe, which are prized as food. This fish is not to be confused with the "dourado" of the main Amazon, a large, edible catfish. (See Ihering, R. v., 1940.)

The "sábalo" (*Prochilodus*, a characin), of the same range given above for the "dourados," is of medium size, with large scales, and is notable for breeding in immense numbers upstream in foothills during high water. At this time, and later at lower water, hundreds are caught, often in rock weirs (gorge of the Pilcomayo), and dried for future consumption. In Venezuela, "sábalo" applies to the famous marine tarpon, a large fish with large scales.

The cannibal fishes, "piranhas," "caribes," or "palometas" (*Serrasalmus*, *Pygocentrus*, pl. 47), occur in the Orinoco, Amazon, and La Plata drainages. They are from 20 to 40 cm. (8 to 16 in.) long, with a high, narrow body and a large terminal mouth armed with alternating sharp blade-teeth, which occlude with a distinct underbite and are capable of inflicting a severe wound, characteristically in the form of a gouged hole or of subequal, opposing crescent scars. Apparently these fishes live in schools, are attracted to blood and raw meat (chemotropic), and when hungry can reduce a helpless man or animal to a skeleton in a few hours. In some places, especially in the clear-water foothill streams, they are greatly feared by bathers, fishermen, and boatmen; but are almost ignored in large muddy rivers. The teeth are useful as cutting instruments; and the palatable flesh is eaten. Many stories of their ferocity, some apocryphal, are current.

Order DISCOCEPHALI

The suckerfishes, "remoras," "pilot-fishes," "reversos," "pegadors" (*Echeneis* and *Remora*), are tropical marine fish. *Echeneis naucrates* (to 75 cm., or 30 in.) and *Remora brachyptera* (to 40 cm., or 17 in.) are slim and fusiform, with a laminated "sucker" on top of the head and "neck" with which they normally attach themselves to sharks or turtles for transportation and participation in feeding on the prey caught by the temporary host. These fishes are utilized by the *Carib* of the Caribbean (north coast of Venezuela and Colombia, and islands of the Antilles) as semidomesticated animals, for the capture of sea turtles and manatees, as well as other fish.

Fishing with the suckerfish is one of the most ingenious ethnozoologic traits of Neotropica. The suckerfish, "pegador" (catcher), principally the larger *Echeneis*, is secured by a liana line at the "small" (base of tail), and is transported to turtle or fishing "grounds," where it is released when the prey is sighted by the fisherman. The suckerfish then swims rapidly in the direction of release, finds (by random activity?) and attaches to the plastron of the turtle or the side of the manatee, and remains fastened while both are drawn to the canoe (or vice versa) by steady traction on the line. When the prey is raised above the water, and deposited either in the canoe or on the beach, the suckerfish releases its hold and reattaches to the side of the boat.

Columbus saw this use of the suckerfish on his second voyage in 1494, at the Garden of the Queen Islands, south Cuba; the account in his journal, edited by his son Ferdinand, was published by Peter Martyr and later by Oviedo y Valdés. (See Gudger, 1919.) There seems to be no doubt of the reliability of this record and of the consequent autochthonous nature of the trait. However, there were few if any other subsequent first-hand records until Lady Ann Brassey in 1885 saw the fishing use of the suckerfish at La Guaira, northern Venezuela; and De Sola in 1932 recorded observations at Matanzas, Cuba, and noted reports from other localities in the Caribbean. The trait seems to have persisted among the *Carib* only. Gudger doubted its existence at the time he wrote (1919), and the famous ichthyologist David Starr Jordan discredited the existence of the trait at any time on the ground that the suckerfish was too small for its disk to have sufficient vacuum power to be effective. However, Gudger, from whom most of these details are taken, brought incontestable literary proof to show that the trait not only existed in the Caribbean (before De Sola confirmed its present existence), but also in Madagascar, southeastern Africa (Zanzibar and Natal), and in the Torres Straits and nearby northeastern Australia. The trait apparently is unknown in Venezuela today (R. Smith *in verbis*).

Apparently the suckerfish was caught when young while free swimming among rock and coral reefs and was trained to "hunt." It was probably kept tethered in shallow water and fed by hand. However, details are lacking on these points. It is certain that the natives generally prized their "captives" (semidomesticates), spoke to them in endearing terms, and rewarded them with meat after each successful hunt.

There are many methods of fishing in Neotropica: Hook (shell, bone, thorn) and line (fiber, hide), harpoon (spear), arrow, net, and plant narcotics or poisons. A special arrow, and aiming technique acquired by much practice, are necessary for bow-and-arrow fishing; but more interesting and ingenious is fresh-water fishing with plant narcotics, or fish poisons (this vol., p. 483). (See Killip and Smith, 1931.) Many species of small fish, too numerous to mention here, are taken by this method.

ARTHROPODS (ARTHROPODA): CRUSTACEANS, INSECTS, ARACHNIDS

Three classes of Arthropoda are important ethnozoologically: Crustacea as food, Insecta as a means of disease transmission and annoyance (the direct result of haemotophagous habits), as well as for food and ornament; and Arachnida as pests.

Crustaceans (Crustacea)

The spiny, clawless lobster, "langosta" (*Panulirus*) of tropical and subtropical marine waters, especially in the Antilles, the east coast of South America, and the west coast to northern Perú, is an important food animal. It is large and tasty, and is quite easily taken with spear or by hand. In Ecuador, Indian fishermen dive among the rocks when the surf breaks and visibility for the lobster is poor, after locating the position of the lobsters from the canoes (Schmitt, 1931, p. 232).

The fresh-water shrimp, "langosta" (*Macrobrachium jamaicensis*), is common in permanent streams of the Antilles and the west coast of South America to arid southwestern Perú. This species is large for a shrimp (15 to 20 cm., or 6 to 8 in.) and is highly prized as food. It is captured easily by hand.

Crabs of many species exist in all marine waters of Neotropica and where and when available are taken by hand, line, or spearing stick. The Indians of southern Chile (*Chono* ?) catch the long-legged lithodid crab (*Lithodes antarctica*) in the summer breeding season (when the crabs come from deep to shallow water to breed) by noosing a female and returning her to the water, whereupon as many as five or six males become firmly attached to her in nuptial embrace and all are hauled to the surface. The same female is used many times (op. cit.). The fiddler crab (*Uca*), in the Antilles, is crushed and the fresh juice is poured into the ear to alleviate earache or deafness (op. cit.). Other crabs in the Antilles are (or were) considered to have considerable curative powers for chest ailments when eaten, but often caused gastrointestinal pains instead (Ignacio de Armas, 1888, p. 170).

Giant barnacles (*Balinus psittacus*) exist in southern Perú and in Chile in shallow water, and are utilized as food (Schmitt, 1931).

INSECTS (INSECTA)

This is the largest class of animals, and the amazing abundance and variety of form in the South American Tropics give special character to this fauna. Some few species are important for use as food, or ornament, for ceremonial use, and as noxious pests or as carriers of disease.

Order ORTHOPTERA: Grasshoppers, Locusts, "Gafanhotas," or "Saltos"

Many species occur over most of Neotropica, and some are large (to 15 cm., or 6 in.). These are utilized for food where obtainable in numbers and when necessary. The migratory locust "gafanhota de praga" (*Schistocerca paranensis*, or *S. cancellata*) invades southern Guiana-Brazilia from the Southwest from time to time, and causes great agricultural damage (Ihering, R. v., 1934, p. 206). This situation probably existed also in aboriginal times, and perhaps then the grasshoppers were eaten. Similar invasions by a similar migratory locust with accompanying damage to vegetation have taken place in Colombia and Central America (Ignacio de Armas, 1888, p. 165).

Order ISOPTERA: Termites, "Capim," "Comejen"

There are many genera, all stingless, some living in ground-surface nests of earth cemented with saliva, some in arboreal nests of fecal cellulose, perhaps cemented with some anal-gland secretion. The arboreal nests are important as fuel in the jungle during rains, because they are always dry within and combustible. Individuals of the worker caste are small, and soft, and are eaten roasted. They are caught by breaking the nest, or by inserting a straw to which many immediately cling (C. B. Brown, quoted by Cutright, 1940, p. 313). The winged drones and females are captured around lights, where they swarm on nuptial flight (op. cit.).

Order ANOPLEURA: Sucking lice, "Piolho," "Piojo"

The human body and head louse (*Pediculus*) is an aboriginal parasite on the American Indian, undoubtedly having been brought by the latter to the New World from Asia. The American Indian louse was described as *Pediculus humanus americanus* on the basis of individuals taken from a Peruvian mummy (Ewing, 1927, pp. 20–22). This variety (subspecies) is easily transferable to a few Neotropical monkeys, especially the spider monkey (*Ateles*), and ancient transference is said to have resulted today in a different subgenus and several species of monkey lice (Ewing, 1927 and 1934). The alleged human habit of eating lice is perhaps apocryphal in many cases; killing the lice may be the object. In monkeys, interindividual "picking," which sometimes yields lice, is more an act of social grooming than a search for food (most monkeys are surprisingly free from lice). Human lice are of interest also in the transmission of typhus fever in high altitudes of the middle Andean region, though the aboriginal presence of this disease is doubtful.

Order SIPHONAPTERA: Fleas

This order contains one member which is known to have been aboriginally parasitic upon Neotropical man since pre-Columbian times. It is the foot-flea, "chigger," "bicho de pé," or "nigua" (*Tunga penetrans*). The impregnated female penetrates the skin, generally of the foot, where it lives on blood while the eggs grow until the flea swells to the size of a pea. Pre-Columbian Peruvian pottery shows aborigines examining their feet, which have many small holes that undoubtedly represent the sites of extracted niguas (Moodie, 1923, pl. 112). Columbus noted niguas on Hispaniola on his second voyage (Ignacio de Armas, 1888, p. 163). The human flea (*Pulex irritans*) was introduced with the Spanish Conquest, and now it is a widespread pest.

Order HOMOPTERA: "Bugs" of an infinite variety

The lanternfly, "jequitiranaboia," "vipora volanda" (*Lanternaria*, or *Fulgora*), of Guiana-Brazilia is large with eye-spotted wings and a swollen rostrum which uncannily resembles a cayman's head even to eye protuberances and tooth markings. In addition, a long "beak," normally carried between the forelegs and extended forward when sucking plant juices, gives the lanternfly a fearsome aspect, which is responsible for legends that the insect is highly poisonous and spears its victims in full flight, and that it can similarly kill a tree! Perhaps it actually can inflict a painful bite.

The reduviids, cone-noses, kissing-bugs, "barbeiros" ("barbers," because they often attack the face), or "vinchucas" (*Triatoma*, *Rhodnius*), are carriers of Chagas' disease (trypanosomiasis), which may have been present in aboriginal times. Reduviid bugs infest houses, where they take a blood meal from both the human and the domesticated animal occupants. The bite is sometimes painless, sometimes painful; it is evidently a matter of species and degree of consciousness of the victim.

The cochineal insect, or cactus scale (*Dactylopius coccus*, syn. *Coccus cacti*), so famous in Mexican ethnozoology as the source of red cochineal dye, has been unrecognized generally as an inhabitant of Central America and Perú, though the proper cactus-food, and other related *Dactylopius* species exist in these places. However, Cook (1925, p. 104) stated that red cochineal dye was used aboriginally in Perú and even today is sold under the same "macnu," thus implying the natural occurrence there of *D. coccus* (or a closely related form), or its cultural diffusion in aboriginal times from México. There is a possibility that "macnu" is a lac secretion of dark color, even red, of a species of *Dactylopius*, and similar to the "shellac" and "stick-lac" of India. Pre-Columbian lacquer work on wood has been recorded from Perú by E. Nordenskiöld (1931, pp. 95–100), but analysis of the kit-bags of the lacquer artisans showed that this decorative medium was formed from minerals (red cinnabar, yellow orpiment, green malachite) and from special plant exudations (like those making Japanese and Chinese lacquer, though undoubtedly from different trees).

Order COLEOPTERA: Beetles

There are countless species of beetles, some large, of which a few are utilized by the aborigines. Ornaments are made from brilliantly colored wing covers (or elytra), especially of chafers (Scarabaeidae) and wood borers (Buprestidae). Food is obtained from large larvae, especially those of the rhino-beetle, which infest palms, and those of the large wood-boring longicorn beetles. The elaterid genus *Pyrophorus* is strongly luminescent and on Hispaniola was caged for lighting houses, tied to the big toe to aid in night hunting, fastened to body ornaments, and even eaten (Ignacio de Armas, 1888, p. 164). Its efficiency in lighting is high but power is low by modern standards.

Order LEPIDOPTERA: Butterflies and Moths, "borboletas," "mariposas"

Many species of this order are widely distributed; the largest and showiest occur in Guiana-Brazilia and Central America. The larvae of some species are large and are used as food, though the skin is leathery; some other larvae have toxic stinging hairs and are avoided.

Order DIPTERA: Two-winged Flies, Mosquitoes, etc.

This is the most important order from the viewpoint of annoying haematophagous habits and the transmission of disease.

The mosquitoes, "zancudos" (Culicidae), are found over all Neotropica except extreme southern Patagonia-Chilea. Most species are diurnal and commonest in the rainy season, when they are extremely annoying. However, they probably are never numerous or voracious enough to cause human or animal emigrations, as can the North American tundra, north woods or snow *Aedes*. Of many *Anopheles* species, the few which carry malaria, together with the disease, are widely distributed, but the pre-Columbian presence of malaria is highly doubtful; today it can be seen penetrating farther into the hinterland into areas newly opened for settlement.

The small sand-flies (Psychodidae) are common in Guiana-Brazilia, but are inconspicuous. They are important along the western slope of the Peruvian Andes (and southwestern Colombia) in a belt between 1,000 and 3,000 m. (3,000 to 9,000 ft.) elevation where the nocturnal species *Phlebotomus verrucarum* carries Carrion's disease (Oroya fever is the preliminary, often fatal, anemic stage; Verruga fever is the occasional subsequent, nonfatal, nodular stage). This disease may have been severe in aboriginal times, as is shown by representations of verrugalike skin eruptions on one pre-Columbian pot (Moodie, 1923, pp. 489–490, pl. 112). If so, it probably had an inhibiting effect at times on travel and communication between Highland and Lowland Coastal regions. R. P. Strong (1942, 2 : 997) stated that ". . . during the reign of [the Inca] Huayna Capac, thousands of lives were swept away, supposedly from this malady." Moodie (1923, p. 489) recorded that "Zarate, in his history of the conquest of Peru, says that verruga was more destructive than smallpox. Garcilaso de la Vega says that . . . a quarter of the invading army of Francisco Pizarro perished from this disease." However, Hertig (1942, p. 3) stated that the "Epidemic of Coaque" which decimated Pizarro's army was in Ecuador (not Perú) and may not have been verruga, and that, "It is noteworthy that in Perú the Conquistadores did not suffer from the disease, which could well have been of military importance." This, however, as Hertig also explained, may have been because the early trips of the Spaniards, and their later travels, were through areas which even today are unaccountably free of verruga fever, or which were too high or too far south (through Ica) for the disease. However, that verruga fever was pre-Columbian in Perú is hardly contestable; it is not found elsewhere in the world.

Another *Phlebotomus* carries the dreaded and common cutaneous leishmaniasis ("uta," "espundia"), which has a high incidence in the Central Andean region from eastern jungle to the west coast, extending to Honduras. This disfiguring disease certainly was pre-Columbian, as is shown by the typical nasal and labial lesions on early pottery figurines. (See Moodie, 1923, p. 489, pls. 102, 110, 111.)

Gnats, "borachudas," "merihuis," "piums" (Chironomidae, Ceratopogonidae, Simulidae, with genera *Culicoides*, *Simulium*, and others): These small and exceedingly pestiferous flies are most common along flowing clear streams in the foothills of Guiana-Brazilia and Central America, and are seasonal, existing in greatest numbers in the dry season. Some are minute in size but savage blood-suckers, and the bite is highly toxic. They can render human and other mammalian life well-nigh unendurable, sometimes causing actual emigration of man.

The horseflies, "mutucas," "tabanos" (Tabanidae) occur over entire Neotropica. Their size is medium to large (for flies), and they are viciously haematophagous. In summer on the Patagonia-Chilea Pampas, they sometimes occur in great numbers, and drive the guanaco herds to windy prominences, thus affecting hunting activities (Cabrera and Yepes, 1940, p. 258).

An unusual dipterous parasite on man (and some other mammals) in northern and central South America and all of Central America is the "berne," or "nuche," a larva of the human botfly (*Dermatobia hominis*). The botfly deposits a number of eggs on the abdomen of female mosquitoes when it captures them in flight; the eggs develop in a few days to the larval stage and must await the warmth of the mammalian host, at the time the mosquito feeds, in order to open and allow the larva to emerge and drop onto the skin of the new host. The larva immediately penetrates a hair follicle and begins development as a subcutaneous endoparasite. In several weeks, sharp pains notify the host that something is wrong—the larva is turning over, though never emigrating from the skin through which it must breathe by means of an anal siphon. Multiple infections in susceptible people cause unbearable pain with much swelling and some disability. The rôle of the mosquito in this obscure but spectacular cycle of biological transmission was known to some natives and Colonial Whites, and some of these called the larva "mosquito worm," but it is doubtful whether they associated the adult fly with the "berne" or "nuche," or even knew it at all.

Order HYMENOPTERA: Wasps, Bees, True Ants

This order is exceedingly common over Neotropica, and includes many species of which the best known are endowed with a poisonous anal "stinger," and these are important as pests, and as agents in ceremonial torture. The larvae of some species are used as food.

Wasps, "marimbondos," "vespideos," "avispas" (several families), include some large species which are vicious stingers, extremely annoying, and actually dangerous to hypersensitive persons. Were some of these species larger or more numerous, the woods would be uninhabitable; they can make a man roar and stink with fear. The larvae of some species are used as food, and are obtained after the adults are driven away by smoke and fire.

The bees, "abelhas," "abejas" (several familes), include stingless as well as stinging species, but both kinds store honey that is highly desired for food. The *Paressí* of eastern Bolivia keep the stingless bee (*Trigona jati*) in calabashes for their honey (Métraux, 1942 a, p. 162), and the trait is also existent in Venezuela and Colombia (Oviedo y Valdés and Cieza de León, quoted by Ignacio de Armas, 1888, pp. 157–158). Columbus thought he saw honeycombs of bees in the Antilles, but later failed to find the bee colonies, and probably originally observed sponges instead (idem). The European honey bee (*Apus mellifera*) has been introduced into Neotropica, and now is feral in many places, where its nests in trees are exploited as are those of native species. Its light honey sharply contrasts with the dark, "strong" product of the stingless species.

Ants in Neotropica number scores of species, and often the colonies are numerous and each contains thousands of individuals. A few species can sting with a violently poisonous effect, and can be veritable scourges and cause the abandonment of human habitations. Human use is as food, or as torture agents in the "ant ordeal," a culture trait of the Tropical Forest.

The "tucandeiros," or "hormiga congas" (*Paraponera*, *Grandiponera*), are conspicuous by their huge size (2 cm., or ¾ in.), black color, and highly virulent poison. They are greatly respected and feared, and probably are used as agents in endurance tests at initiation rites. Fortunately, the individuals are semisolitary, and the colonies are small.

Fire ants, "formigas do fogo," "hormigas de fuego" (*Wasmannia*, *Pseudomyrma*, etc.), are small, reddish ants with a terrific sting. Some species form colonies in trees, some in the ground, and one species actually caused the abandonment of the village of Alveiros on the Tapajóz River, near the Amazon, Brazil (Bates, H. W., 1892, p. 227). Probably native villages suffer in a similar way. Fire ants are also utilized as torture agents in initiation ceremonies. The toxicity of the venom from the abdominal sting is so great that even the minute quantity injected by a single individual can produce powerful ill effects.

Army ants (*Eciton*) of Guiana-Brazilia and Central America are small, colonial, nomadic, and of similar poisonous potentiality and use as fire ants, but are more impressive in their social organization. Their nomadism causes hordes to move through the jungle in military fashion, and every living organism, including man, must flee.

The famous leaf-cutter ants, "sauva" (*Atta*), are found throughout Guiana-Brazilia, Central America, and the Antilles, where they damage and sometimes devastate plantations. There is probably no cultivated plant, except some with milky sap, as mandioc, papaia, *Lonchocarpus*, etc., that they will not attack. The vegetation that is cut and carried to the nest is not eaten, but is used as a culture medium for a fungus which forms the food of the ant. The *Atta* ants are stingless, large, colonial, and their huge underground nests in the woods are easily identified by the freshly excavated earth and elevated profile, surrounding defoliation, and the great numbers of convergent, small, clean trails. The soldier caste is large with huge, opposing, sickle-shaped mandibles, which are used by certain Guiana

Indians to close wounds; as the ant tenaciously hangs on after biting through both sides of an appressed incision, the head is severed, leaving it and the closed mandibles attached as a suture. Individuals of the worker caste are eaten occasionally by man. The large *Formica cephalotes* in Brazil is also used to close wounds. (See Gudger, 1925, quoting W. Beebe and E. Mocquerys.)

ARACHNIDS (ARACHNIDA)

Most striking of the spiders are the huge bird spiders (*Avicularia*), often erroneously called tarantulas. They are large (span of 20 cm., or 8 in.), with a thick fuzz of toxic spiny hairs on the abdomen. The bite is fairly poisonous. They are found from the low jungles to altitudes of at least 3,500 m. (11,500 ft.) near the punas of the Andes.

Another spider of possible ethnozoologic importance is the black-widow, "aranha" (*Latrodectus*), of the warmer parts of Neotropica, often found in human habitations. This is a small spider with a shiny black globular abdomen which is marked by a reddish or whitish spot below. The bite is dangerous.

Ticks, "carrapatos," "garrapatos" (Ixodidae and Argasidae), are common in Neotropica, often in unbelievable numbers, but such extreme abundance is probably a result of the post-Columbian cattle industry. Ticks are a severe pest, especially in the larval form, and occur literally by the million in some places in the dry season. *Amblyomma cayennensis* transmits spotted fever in southeastern Brazil and Colombia today, but the pre-Columbian presence of the disease is questionable.

Mites, "miquims" (Trombiculidae), are a veritable plague in the dry season in grassy areas. Only the larval stages of this family are haemotophagous.

MOLLUSKS (MOLLUSCA)

The Neotropical molluscan fauna, marine, fresh water, and land, is rich and possesses many large and brilliantly colored species. They exhibit the typically remarkable endemicity of the Neotropical fauna. The shell mounds of the southern half of South America are built principally of the shells of this phylum, the shellfish having been used for food. The principal marine and fresh-water forms are the oysters (*Ostrea*), clams (*Unio*), mussels (*Mytilus*), conchs (*Strombus*), and the limpetlike *Concholepas*. Mention of the many species involved is omitted here, though this does not mean that the group is unimportant.

The fighting conch (*Strombus pugilis*) was found to have been the "staff of life" for the Antillean aborigines inhabiting Samana Bay, Hispaniola, but peculiarly enough the beds were not known to the present natives (Miller and Krieger, 1929, p. 47). This may be the result of actual shifting of the conch, or the obliteration of its bed by sand and hurricane action, thus perhaps causing human emigration. However, just as plausible is the explanation that the conch is unavailable to the natives for the greater part of the year because it moves into shallow from deep water only to spawn. Thus the shell mounds referred to may be seasonal sites only.

Land snails, especially the huge Guiana-Brazilia *Strophocheilus* (syn. *Bulimus*), are also used for food.

There are but few special techniques for capture; most species are taken at low tide, with the hands or with the aid of a stick or any other implement.

Mollusk shell fragments are used as cutting implements, containers and ornaments. The shell of the razor-mussel is particularly adaptable as a knife, that of the giant conch as a container, horn or trumpet, that of *Concholepas* as a boat-bailer (Townsend, 1910, p. 13), and those of the more brilliantly colored shells of both land and water species as ornaments.

The "sambaquís" of the Brazilian coast are not invariably human-deposited shell mounds, but most are natural coccinos of unopened shells of oyster, mussel, and *Azara prisca* (Serrano, Handbook, vol. 1, pp. 401–407).

Pearls are derived from mollusks, principally *Pinctada* (syn. *Avicula;* not the edible oyster) and the Pearl Islands of the Caribbean were famous for their pearls long before the arrival of Columbus. The giant conch (*Strombus*) sometimes yields pink pearls (Cooke, 1895, pp. 100–101).

ECHINODERMS (ECHINODERMATA)

The large class includes sea urchins, sand-dollars, starfish, and sea-cucumbers. Sea urchins are utilized as food, especially in the Patagonia-Chilea region. Here the globular spiny animals are collected in numbers and broken to extract the large ovaries, which are eaten.

DOMESTICATED ANIMALS

In Neotropica there are four indigenous domesticated animals: llama, alpaca, cavy (guinea pig), and Muscovy duck. The dog has been present also, and from very early times, but it is not a Neotropical endemic. The European horse (*Equus caballus*) was unknown in pre-Columbian times, but was redomesticated from feral Spanish herds in the early 17th century by certain southern Indians (*Tehuelche, Diaguita*, etc.; see Handbook, vol. 1, pp. 14–15, 202–203). Extinct horses of other species were known to the early aborigines, and were hunted and eaten by them, but were not domesticated to our knowledge. The turkey is a Mexican domesticated bird, though it penetrated by cultural diffusion to Colombia, Venezuela, and northern Perú in pre-Columbian times. All members of the family Bovidae were absent from pre-Columbian Neotropica at any time; the Spaniards introduced domesticated cattle, sheep, goats, and pigs, and in many places cattle and pigs are now feral. The Asiatic water buffalo "búfalo" (*Bubalus bubalis*) was introduced from Italy to the lower Amazon region, especially the Isla de Marajó, for agricultural purposes (plowing, transport, meat, milk), but the cultural response was largely negative, and the surviving buffalo are now raised for meat in a casual way or have become feral in the vast swamps on the northern edge of Marajó Island where they constitute a menace to humans on account of their truculent and wily disposition and great size. True camels (undoubtedly the Arabian, or one-humped species, *Camelus dromedarius*) were introduced at an early date into the desert areas of coastal Perú, but were not integrated culturally and became entirely extinct. Eaton's identification of the bison in a Cuzco grave (1912) was later withdrawn (1913) in favor of a post-Columbian cattle specimen. Chickens also were introduced (but see p. 394).

The dog poses a special problem. It was found in the form of at least nine breeds throughout Neotropica (and additional breeds were widely distributed throughout Nearctica). Owing to the fertility between dogs and wolves (with fertile offspring), it may be difficult to believe, as C. O. Sauer says (personal communication), "that the dog [in the New World] can be passed off as a series of mutations derived from an original Asiatic stock." The situation is complex and confusing, but may be summarized here by the following statements: (1) Man brought a breed, or breeds, of dog with him from Asia, at least in his later immigrations; (2) all American aboriginal Indian dogs seem to be morphologically "dogs," and not domesticated coyotes or foxes (most dogs seem to be sufficiently distinguishable from any other canid to justify the belief of most specialists that they form the distinct species, *Canis familiaris*); (3) dogs will mate easily, and have mated often, under favorable conditions in nature, with wolves, dingos, and perhaps coyotes and jackals (though crosses in nature with either of the latter two are probably rare), and the offspring are fertile; (4) dogs and foxes will not mate normally in nature, and rarely under control; (5) all the Recent canids of Neotropica are "foxes" of the genera *Chrysocyon*, *Urocyon*, and *Dusicyon* (including here *Cerdocyon*, *Lycalopex*, and *Pseudoalopex*, p. 377), and the aberrant bush-dog, *Icticyon venaticus;* (6) no wild member of the genus *Canis* (sensu stricto, e. g., wolf, coyote) has been known to occur very far south of the tableland of México in the last several thousand years and hence, not in that time in Neotropica; (7) however, in the late Pleistocene and perhaps early Recent, a true *Canis* (wolf type) did occur in South America, and perhaps was contemporaneous with early man, with or without domestic dogs of Palearctic (or Nearctic) stock; and (8) dogs of the world seem to have the same genetic constitution and hence mutational and gene-combinational potentialities, witness the independently derived breeds of "bulldog," "greyhound," or "foxhound," "setter," "terrier," and "hairless" in the Old and New Worlds. (See Allen, G. M., 1920; Krieg, 1929, 1939; Cabrera, A., 1932, 1934; Young and Goldman, 1944.)

Krieg (1925) recorded the breeding of a female "*Pseudalopex azarae*" (*Dusicyon gymnocercus*) with a male fox terrier hybrid, (terrier × fox ?). *Dusicyon* is more like *Canis* than the other genera of South American "foxes," and this may be significant.

The oft-used distinct terms "dog" and "wolf" perhaps need concrete definition. The most common dog characters are: Wolf-type skull with smaller dentition, rounder braincase, higher forehead, shorter snout, larger orbital angle and smaller audital bullae, ability to bark, and an erect and mobile tail. However, considering known interbreeding with wolves, it is obvious that these characters (and others alleged) are not absolutely constant in some individuals of some breeds of dog. (See Miller, 1912, p. 313; Iljin, 1941.)

The Neotropical breeds which have been adequately described are: *Inca* dog (medium size), long-haired *Inca* dog (medium), Peruvian pug-nosed dog (small, bulldoglike), Fuegian dog (small, terrierlike), *Ona* dog (medium, setterlike), *Tehuelche* dog (large, foxhound or greyhoundlike), *Techichi* dog (small, terrierlike), and small hairless dog. (See Allen, G. M., 1920; Cabrera, A., 1932, 1934.) The alleged wild indigenous "perro cimarron" of Argentina has been shown by A. Cabrera (1932) to be derived from feral European stock. Latcham (1922) expressed the view that practically all the breeds of Neotropical dogs were derived from native fox species; but this position is extreme.

Two other breeds are questionable: the mute dog and the humped dog. Mute dogs were recorded from the Antilles, adjacent coast of northern South America, Perú, and México (Ignacio de Armas, 1888, pp. 32–34). Close examination of the quotations and text, however, reveals that these dogs were not truly mute, but merely nonbarkers, and that they represented several of the above-mentioned breeds. Some modern breeds or local populations of dogs do not bark normally (Eskimo dog, Basenji dog of Africa), and nonbarkers or their descendants learn to bark in association with barkers. Hence, it seems best to conclude now, in respect to these early Neotropical "mute" dogs, that they were local populations of one or of several breeds which, through severe conditioning (training) or through natural inclination and isolation, were nonbarkers. They could vocalize in whines and perhaps howls. Barking, and even howling, may have been sternly suppressed by severe punishment as a precaution against disclosing hidden villages to human marauders. Some of these non-barking dogs may have been tame foxes or bush dogs. Humboldt (Ross ed., 1852, 2:510, footnote) suggested that mute dogs might have been individuals castrated and raised for food, as was done in early México.

The humped dog is perhaps even more of an enigma than the "mute" dog. There are several early Spanish references to humped dogs ("el dorso arqueado, formando una especie de joroba," "pronunciada joroba," "perros mal conformados," etc.; Ignacio de Armas, 1888, pp. 37–40, quoting earlier authors), in the Antilles, Central America, "New Grenada," and Perú. Like the "mute" dog, the humped dog seems to have included several breeds or local populations, though some might have been occasional deformed individuals.

In this study, no detailed examination of canid material was made.

Domestication is a phenomenon which is difficult to explain or define accurately, and it is equally difficult to make a list of domesticated animals. Rather than limit the definition to any single condition, it seems best to consider several conditions and several classes or degrees of domestication.

A distinction must be made between "domesticated" and "tamed wild" animals. The latter generally are isolated individuals which are caught wild (usually when young) and tamed as pets. However, such a condition grades into that in which animals are caught purposely in numbers in the wild state and kept for certain economic purposes, e. g., the elephant. All tamed wild animals are utilized, at least as pets in an esthetic sense, so the fact of utilization should not enter into the definition of either a domesticated or a tamed animal—all animals taken purposely by man into his company are utilized in some way.

A distinction is necessary also between "domesticated" and some "domestic" animals. Some of the latter, sensu stricto, are natural commensals such as the house fly, cockroach, house mouse, house rat, English sparrow, European stork, black vulture, etc., which have attached themselves "voluntarily," and, in some cases, in spite of opposition, to man and his domicile. "Domesticated" never should be applied to the latter group of animals, though both "domestic" and "domesticated" can be applied to man's conscious purposeful establishment of symbionts (domesticates). Both a domesticated animal and man have necessary interdependent and mutually beneficent relationships which arose from a commensalistic condition (natural or otherwise), but which later developed into a symbiosis. This symbiosis, however, is usually not obligatory—either partner may exist without the other, though the animal under this condition reverts to a wild state with usually a slight change of morphology;

and man without his animal changes culturally. Some very highly specialized breeds obviously could not exist alone, or even revert to wild type before extinction; and vice versa, some human cultures could not exist without their domesticates (Arab in some places without camels and horses).

Domestication should apply to an animal species which meets the following conditions: That it (1) is integrated into human culture; (2) is kept forcibly under human control for a purpose; (3) is dependent upon man, either voluntarily or involuntarily, for survival under this prior condition; (4) generally breeds under the artificial conditions of human control; and (5) generally is modified into breeds (or strains) through selective breeding by man.

This definition gives several degrees of domestication: (1) Ordinary, or highly domesticated animals—those which answer all conditions (generally widespread geographically also); (2) semidomesticated animals—those which answer at least the first three conditions. Some semidomesticated animals, e. g., pearl oysters, silkworms, honey bees, etc., have been called "cultivated."

The reasons that some animals have been domesticated to any degree whatsoever are also difficult to state. However, they certainly involve cultural as well as zoological factors, and some of the following may be important: (1) Cultural stimulus (either religious, economic, or esthetic), which gives and sustains a purpose and value to the act and the animal, and which in most cases probably originates in concentrated settled populations of peoples who have already had the knowledge and background of cultivated plants; (2) calm and docile disposition of the animal, which results in easy adaptation to confinement and generally involves no difficulty in breeding; (3) play instinct well developed (in mammals); (4) chance (meeting of the animal and the culture); (5) perhaps a commensalistic or symbiotic tendency of behavior in the animal, which manifests itself (*a*) in some sort of stratified social organization in nature and docile subjection to man in captivity, and/or (*b*) in some degree of attraction to other organisms, especially under stresses of nature (famine, drought, cold, flood, extinction, etc.), because, generally, physically subnormal or exhausted animals are more easily tamed than robust healthy ones, and/or (*c*) in some "domestic" attachment to man which later turns into a domesticated symbiotic relationship; and (6) sometimes (adventitiously) a plastic germ plasm, which provides many combinations of genes in variations and mutations that can be utilized for selective breeding into distinct strains (though it seems likely that most selection is fortuitous, especially in the lower cultures). Young animals fall in the fifth category.

It would seem that there exist many wild animals which are potentially domesticable, and perhaps chance has so far prevented their domestication; but, on the other hand, nearly all of our truly domesticated animals have an ancient history, and few new ones have been added recently. Hence, there may exist very good zoological reasons, or lack of certain factors, zoological as well as cultural, which have prevented and will prevent domestication of such forms. A study of seemingly domesticable animals, from the cultural and biological viewpoint, may clarify the positive factors favorable or necessary for domestication of others.

Fear is a strong factor in the behavior (and in the domesticability) of an animal; some species are born without this emotion but acquire it later in life (most higher forms, including man). Young animals of these species are easier to tame than older members. However, some animals can be tamed in the adult as well as in the immature states (falcon, otter, etc.). There is obviously much to be learned about domestication, but also enough variability to preclude facile generalizations.

The establishment of special breeds of domesticated animals is an interesting phenomenon. The general idea of the mechanics of reproduction, and of heredity, must have been known to aborigines, especially to those with cultivated plants and domesticated animals, but it seems that the conscious establishment of a breed is generally a function of a high culture which gives a special stimulus to the production and preservation of the breed. Without some cultural stimulus, the perpetuation of domesticated stock appears to proceed haphazardly as far as selective breeding is concerned. However, with a stimulus from religion (producing breeds of black llamas, white llamas, white alpacas, and perhaps 5-toed llamas), or from economic pressure, or from war, hunting, or sheer amusement, special breeds will be perpetuated and perhaps consciously developed by merely isolating and breeding desired like with like and segregating the results. Special craftmanship, secret or public, with special hereditary groups of animal husbandrists, will subsequently develop, and this will accelerate the process of breed development and improvement. In addition, breeds or strains can be developed naturally and unconsciously by natural selection, when the domesticated animal in question is continually forced to live in more extreme conditions of climate or to perform more arduous conditions of work. In these cases, only those individuals with the inherent ability to survive and breed can perpetuate the species, with a consequent fixation of the naturally selected combinations of characters in the newly developing breed.

However, there is a limit to the amount of diversity which can be produced by selection—a limit fixed by the inherent gene-combination and gene-mutational potentialities of the germ plasma, unless mutation intervenes. It remains to be proved that the combinational and mutational possibilities of llama germ-plasm could have produced the alpaca, though such may be possible.

Domestication is such a large and controversial subject that it cannot be discussed further here.

A list of the Neotropical domesticates and semidomesticates and other animals important in ethnozoology is given on pages 346–347.

LLAMA, ALPACA, GUANACO, VICUÑA (SOUTH AMERICAN CAMELIDS AND LAMOIDS)

These four forms are typical exclusive members of the Patagonia-Chilea fauna, and all are (or were) important in the economy of man in that region of South America. The llama and alpaca are known now in the domesticated state only; the guanaco and vicuña in the wild state only (though some few herds of vicuña are in semiconfinement for commercial wool exploitation).

As members of a distinct group of Camelidae, the South American forms have:

Long necks and legs; long ears; medially split upper lip; two-toed feet (except Chancay Peruvian pre-Columbian breed with five front toes—see below), with terminal two phalanges placed flat on the ground (almost digitigrade instead of unguligrade), and though apparently cloven, not completely so, but united posteriorly in a common pad; utter absence of metatarsal splints as remnants of other side digits; a distally slightly bifurcate metapodial (cannon-bone, articulating distally with the phalanges and proximally with the carpus and tarsus); paired metatarsal glands (on shank of hind leg, below hock, heel, or calcaneum); complex three-chambered stomach; dental formula of I 1/3, C 1/1, P 2/1, M 3/3 (with I 3/ caniniform; milk dentition DI 1/3, DC 1/1, DP 3/2); functional mammae four, inguinal; no dorsal hump; red blood corpuscles elliptical instead of circular (enucleated, however, like all other mammals); single precocious young after gestation of 10–11 months; polygamous herd composition, with male dominance and female and young male subjugation in a stratified social organization; herbivorous and ruminant; spitting, biting, and kicking attack and defense; common voiding places for feces and urine; playful disposition and affectionate nature when young; calm and stolid, but easily alarmed and stampeded; copulation "lying down" (Garman, *in* Allen, J. A., 1876, p. 352); and generally with similar and restricted habitat and range. Sexual dimorphism is slight, but male skulls are easily distinguished from those of females by larger canines and larger caniniform I 3/. The rumen of the complex stomach has so-called "water-cells," but Pocock (1923, p. 542) claimed that these are filled generally with food to later regurgitate and rechew (ruminate), and that in the camel these cells contain water only when food is unobtainable. The mechanism of water "storage" in true camels seems to be in the metabolism of hump and subcutaneous fat and body carbohydrates, and there should be a parallel (even without hump) in the lamoids, because body-water consumption is probably exercised on long, forced, and dry marches which llamas, at least, can make and are known to have made. E. C. Romero stated that the llama can go three or four days without water (1927, p. 44). Physiologically, camels and lamoids probably are well adapted to thrive on scanty vegetation, and to derive much carbohydrate from cellulose by enzymic and/or bacterial action in the rumen of the complex stomach. Carbohydrate yields more water than fat in metabolic energy transformations (Dill, 1938, pp. 4–7).

From the Old World camels, the South American forms differ by absence of: dorsal hump, sternal, knee and hock callouses (normally), P 1/1 (caniniform), and such large size (the dromedary and Bactrian camels may weigh 1,000 kg., or 2,200 lbs.). The llamoids possess a shorter and more heavily haired tail, feet more deeply cloven, metatarsal glands, and are much smaller (never over 150 kg., or 330 lbs.).

All except one of the known species of camelids in the world apparently are found in the domesticated state only. They are: Dromedary (one-humped, or Arabian) camel, Bactrian (two-humped) camel, llama, and alpaca. Herds of "wild" members of both camel species generally are believed to be feral domesticated individuals, though Harper (1945, p. 421) stated that evidence exists to show that the wild Bactrian camel of "certain desert areas of Chinese Turkestan and Mongolia . . . is a genuinely wild animal, not contaminated to any appreciable extent with the blood of the domestic animal," with anatomical differences to justify the subspecific name *Camelus bactrianus ferus*. The guanaco and vicuña exist in the wild state only, and the latter never has been domesticated despite many attempts. The guanaco perhaps is the wild progenitor of the llama. If there is any basis for believing that there are inherent qualities in an animal or group of related species which favor domestication, such qualities may be found in the camel family.

The South American camelids have been classified recently as follows (Lopez Aranguren, 1930; Cabrera, 1931; Cabrera and Yepes, 1940, pp. 256–269):

Family Camelidae:
- Genus *Lama* Cuvier, 1800. Llama, guanaco, alpaca.
  - *Lama guanicoe* Müller, 1776. Guanaco.
  - *Lama glama* Linnaeus, 1758. Llama.
  - *Lama pacos* Linnaeus, 1758. Alpaca.
- Genus *Vicugna* Lesson, 1842. Vicuña.
  - *Vicugna vicugna* (Molina, 1782). Vicuña

Or, the classification may be the following scheme, which is preferred here:

- Genus *Lama.* Guanaco, llama, alpaca, vicuña.
  - Subgenus *Lama.*
    - *Lama glama glama.* Llama.
    - *Lama glama guanicoe.* Guanaco.
    - *Lama pacos.* Alpaca.
  - Subgenus *Vicugna.*
    - *Lama vicugna.* Vicuña.

(The generic name *Lama* dates from Cuvier, 1800. *Lama* Frisch, 1775, is not considered binominal by most taxonomists. *Auchenia*

Illiger, 1811, is preoccupied by *Lama* Cuvier, and also is a homonym of *Auchenia* Thunberg, 1789, a genus of beetles. The oft-used name *huanacus* (Molina, 1782) is antedated by *guanicoe* (Müller, 1776) for the guanaco.)

The latter classification intends to show what are considered here to be the natural relationship between members: (1) All four kinds are recognizable taxonomically, and three are distinct species; (2) the llama and guanaco are most closely related, probably subspecifically; (3) the alpaca is the next most distinct member, perhaps a full-species; and, (4) the vicuña is the most distinct. These relationships could be brought out more clearly by setting up two subgenera, one to include the llama, alpaca, and guanaco; the other to include the vicuña.

The classification of the lamoids is indeterminate in that the llama and the guanaco have been considered specifically distinct, or conspecific but subspecifically separate; and the vicuña has been ranked as a good species in a distinct genus, or merely as a species in the genus *Lama* without (or possibly with) subgeneric rank. The alpaca has been treated as a hybrid between the llama and the vicuña, or as a derivative of the llama, or as a separate species. The latter alternative in all the above cases is the one preferred here. Indeterminism in taxonomy is not always a fault of the students, but rather of confusing zoology; in this case, perhaps, as a result of the domestication of two of the four kinds involved. For a list of the earlier authors and their many opinions, see Lopez Aranguren (1930) and León (1939).

The points of confusion are listed specifically as follows:

(1) Difficulty is experienced in confidently analyzing and evaluating the morphologic characters of the four lamoids, because: (*a*) very close similarity exists between the skulls of guanacos and llamas, without sharply separating characters; (*b*) less similarity (more disparity) prevails, however, between the skin characters (color, pelage, molt) of guanacos and llamas, but a few llamas closely resemble the guanaco; (*c*) more marked distinction is present in the skins and skulls of alpacas, but some degree of apparent intergradation between llamas and alpacas exists in the general run of llama herds to be seen in Bolivia and Perú; (*d*) enough wide variation exists in the skulls of wild guanacos from the same herd to cover all the characters of llamas, and some of those of alpacas also (see Peterson, 1904, pp. 442–445); and (*e*) there is a peculiar vicuñalike aspect to some of the characters of the alpaca.

(2) All four kinds apparently can interbreed or be crossed and produce fertile offspring; but apparently, also, there is a segregation of characters and reversion to parental types after continued inter-

breeding of the hybrids, and there is probably some degree of sterility of the F1 hybrids when the vicuña is involved in the crosses.

(3) Modern methods of breeding technique have failed to domesticate the vicuña, as have all other historic attempts.

(4) The normal range of the llama is much smaller than that of the guanaco and apparently has been so in historic and aboriginal times. This is paradoxical if the llama is held to have been derived from the guanaco. The llama does not seem to be a specialized high-altitude breed, but the coastal Peruvian aborigines are said to have had high mountain breeding grounds for their llamas; from this it can be inferred that llamas did not breed well on the Peruvian coasts, but this itself may have been a secondary result caused by the absence of a forage crop and pasture for any but the work llamas (castrated?) (p. 440). Attempts to introduce the llama into the United States, England, Scotland, Ireland, and Australia have been without success (Tappy, 1944, p. 48). However, there would seem to be cultural grounds for some of these failures, just as the camel has failed to become established in the southwestern United States and Perú (though it was introduced successfully into Australia).

(5) The home range of the alpaca is even more restricted, and efforts to establish it in various foreign countries to live in numbers at low altitudes have been unsuccessful. However, there is good reason for believing that the alpaca is a highly specialized breed (or species) which is best adapted to high altitudes.

(6) Lopez Aranguren (1930) and especially Cabrera (1931) claimed to have identified fossil remains (skulls) of all four kinds of lamoids from Pleistocene deposits in southern Neotropica.

(7) There has been a general lack of an accepted definition of a species. The definition followed here is: A species is a group of individuals whose populations normally exchange genes in nature. An interchange of genes by forced interbreeding between two distinct kinds of animals does not necessarily mean conspecificity.

It is difficult if not impossible to reconcile all these conflicting points into one acceptable scheme of classification. Diametrically opposed statements of "fact" are legion.

In the following pages, the listed characters of the lamoids are to be considered as average, and not, except in the case of the vicuña, or as otherwise stated, implying sharp definition.

Genus *Lama*. Subgenus *Lama*.

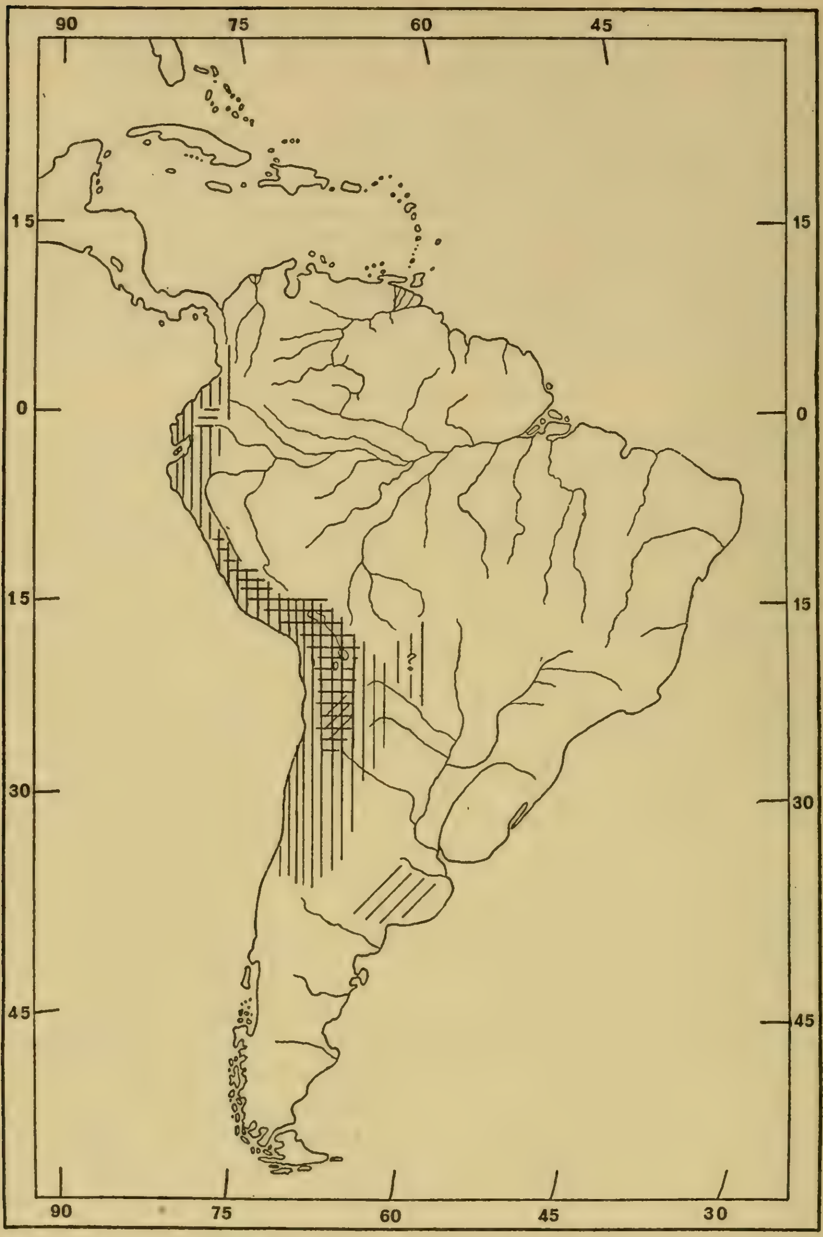
The llama, alpaca, and guanaco, are characterized by: (1) Lower incisors rooted, spatulate, imbricate, with enamel on both inner and outer sides; (2) mandibular symphysis long (length to breadth as 2 : 1, to 7 : 4); (3) submental foramina just anterior to menton (rear of mandibular symphysis); (4) facial pits large; (5) choanae narrow V, open V, or narrow U; (6) vomer notched posteriorly (no spinous process); (7) incisive foramina generally opposite and extending anteriorly to I 3/; (8) P 3–4/4 large; (9) heel of M /3 large; (10) large size and relatively long snout; and (11) no patch of long brisket hairs on chest.

Genus *Lama*. Subgenus *Vicugna*.

The vicuña is ranked and characterized by: (1) Lower permanent incisors open-rooted, persistently growing, straight chisel-shaped (like rodent), with enamel on outer (labial) side only; (2) symphysis of lower jaw short (length to width as 4 : 3); (3) submental foramina just posterior to menton; (4) facial pits absent or very small; (5) choanae (internal nares) generally in open U-form; (6) vomer ending posteriorly over presphenoid in long spinous process; (7) incisive foramina (of premaxillaries) opposite and extending posteriorly to I 3/; (8) P 3–4/4 small; (9) heel of M3/ small; (10) general size of body and weight small, and snout short; (11) heavy patch of long brisket hairs on chest (especially in winter).

Lama glama glama, or L. glama: Llama

Distribution.—At present the llama is found throughout the High Andes from central Ecuador (Riobamba) south to northern Argentina, except for some small gaps between southern Ecuador and Cerro de Pasco, central Perú (map 12). In early historic and prehistoric times up to the 18th century, it occurred in Coastal Perú and Coastal southern Ecuador (Guayaquil, Puná Island), northern Ecuador, and southern Colombia (Pasto ?), and as far south as Santiago, Chile, and perhaps out on the Chaco of Paraguay. This distribution roughly coincided with the greatest extent of the *Inca* Empire and presumably was a direct result of the *Inca* conquests, but there is evidence that the llama existed in Ecuador several thousand years earlier (Murra, Handbook, vol. 2, p. 792). An Indian cacique is said to have described a beast of burden to Balboa in Panamá and to have drawn a figure which was interpreted by the Spaniards variously as a camel, an elk (female ?), and a tapir (Ignacio de Armas, 1888, p. 71). This may mean, if the story is true, that llamas were diffused culturally from the *Inca* in Ecuador to the mountains of northern or central Colombia shortly before the 16th century, or that the cacique was a "traveling" man. However, the guanaco may have ranged to Ecuador and southern Colombia ("Páramo de Guanaco") at that early time, and the midden bones which have been identified as those of llamas actually may be those of guanacos. The Coastal herds in *Inca* times probably never bred well or had no pastures and were maintained from Highland stock; at least they were not integrated well into the Coastal cultures, because they disappeared soon after the fall of the *Inca* Empire. The occurrence of the llama in Paraguay in the 16th century, as alleged by Schmidl, is held to be questionable, but the Spaniards sometimes rode the llama (as Schmidl stated that he did; see Cabrera and Yepes, 1940, p. 258) in emergencies, or for sport, and early pre-Columbian tombs of Northwest Argentina and the nearby Chaco have disclosed remains of llamas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Map 12.—Distribution of the llama. (*Horizontal hachure*, present range; *vertical hachure*, 15th-century extension; *diagonal hachure*, Pleistocene.) (According to Lopez Ananguren, 1931, and Cabrera, 1932.)

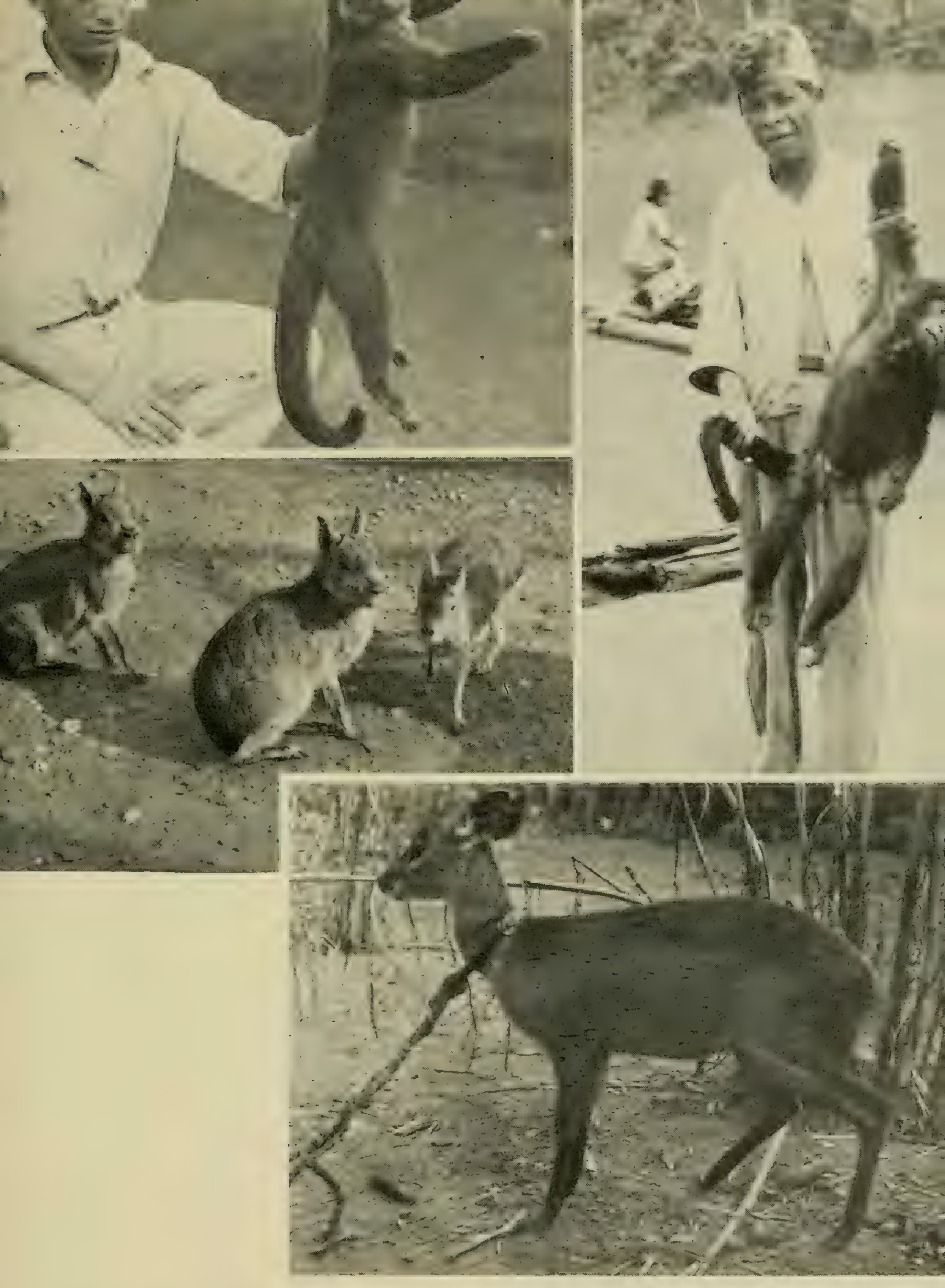


Plate 36.—Monkeys, rodent, and deer. *Top, left:* Common monkey (*Cebus apella*), Anápolis, southern Goias, Brazil. *Top, right:* Howler monkey (*Alouatta seniculus*), Madidi River, north Bolivia. *Bottom, left:* Mara (*Dolichotis australis*), size of very large rabbit, National Zoological Park, Washington. *Bottom right:* Mazama deer (*Mazama* sp.?), size of collie dog, Entre Ríos, southeast Bolivia. (*Top, right,* Courtesy Sulo Sihvonen; others, courtesy R. M. Gilmore.)

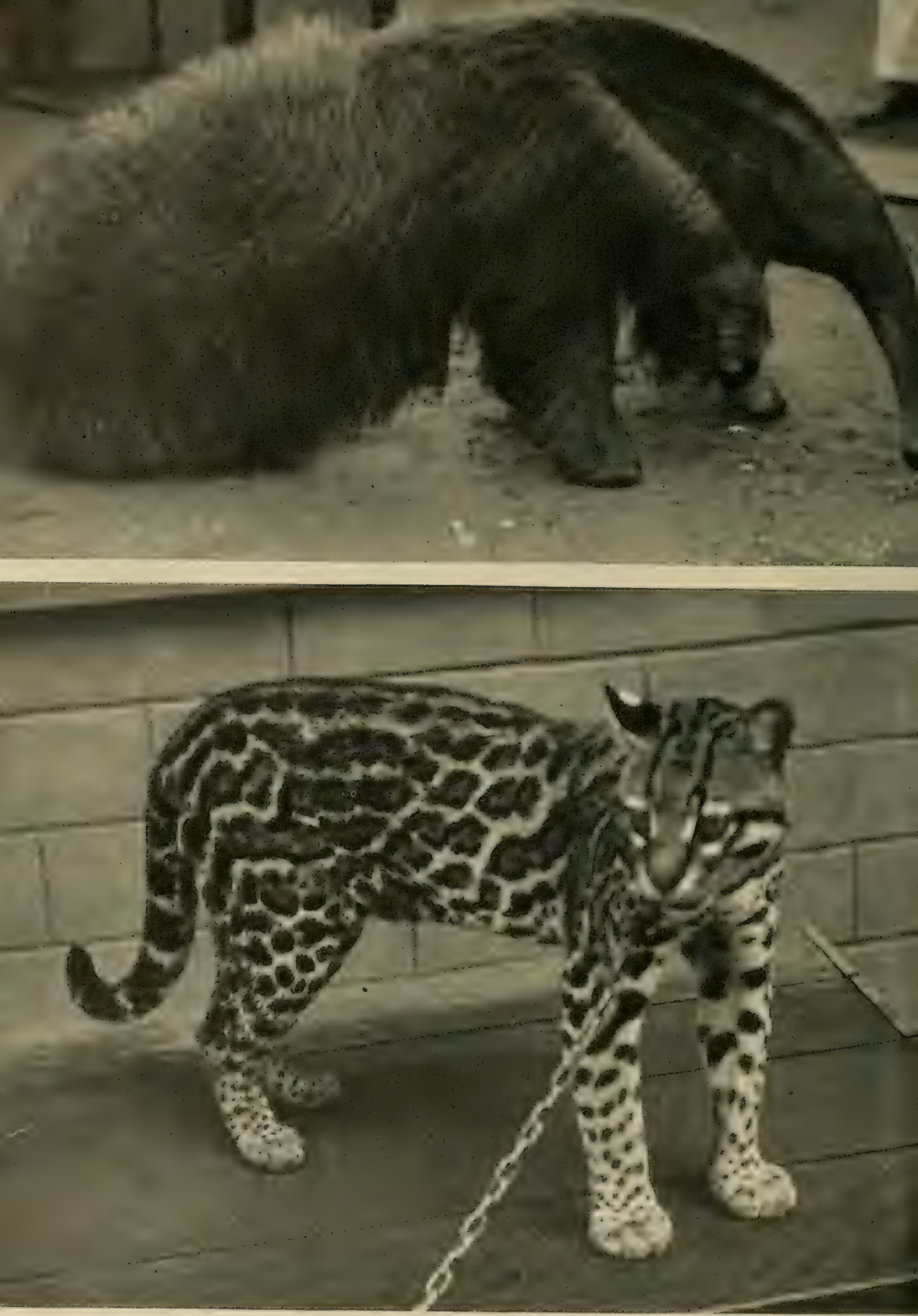


PLATE 37.—Giant anteater and ocelot. *Top:* Giant anteater (*Myrmecophaga tridactyla*), Mato Grosso, Brazil. *Bottom:* Ocelot (*Felis pardalis*), Villavicencio, eastern Colombia. (Courtesy R. M. Gilmore.)

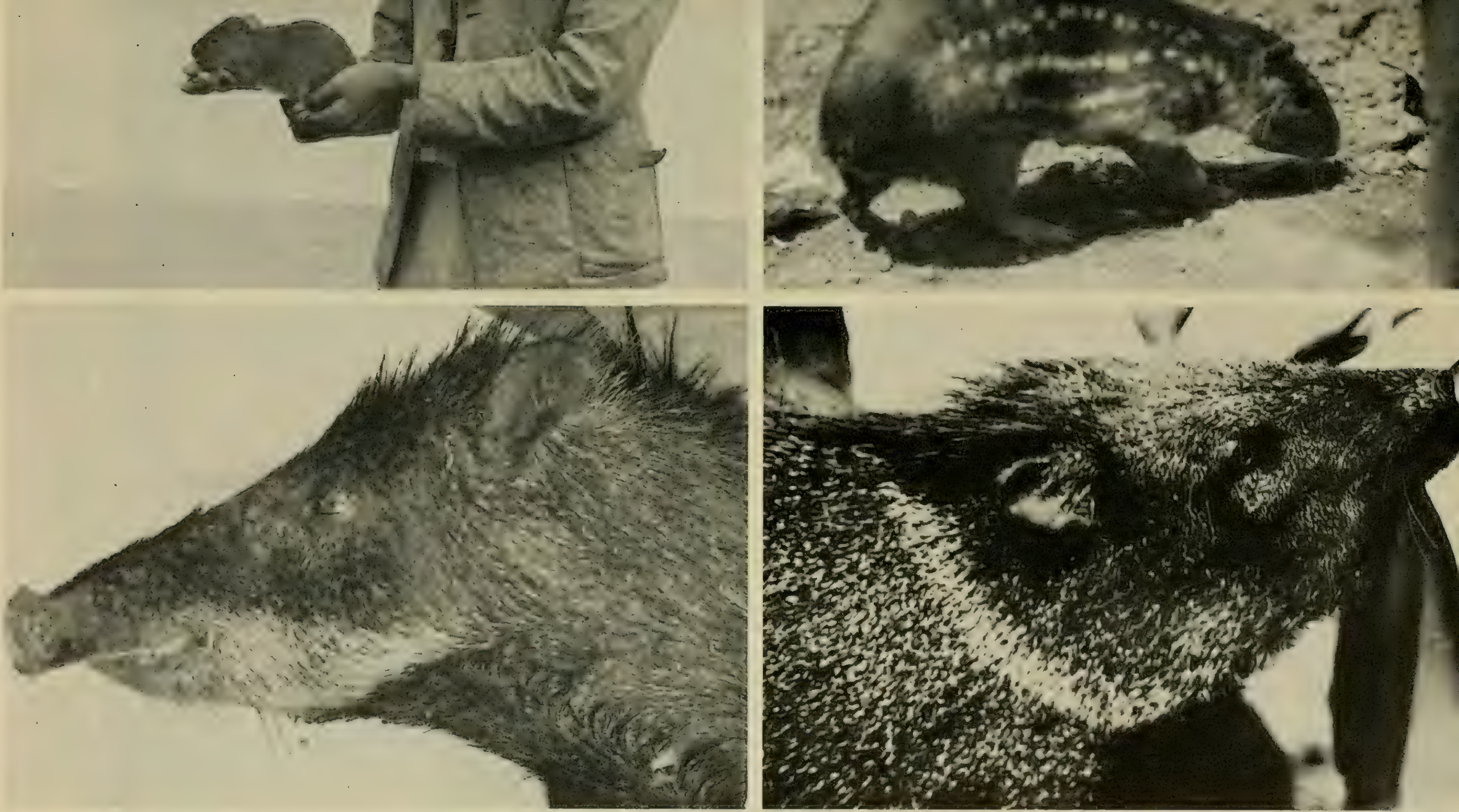


Plate 38.—Rodents and peccaries. *Top, left:* Wild cavy (guinea pig, *Cavia aperea*), Entre Ríos, southeastern Bolivia. *Top, right:* Paca (*Cuniculus paca*), size of small pig of 7 to 10 kg., Anápolis, southern Goias, Brazil. *Bottom, left:* White-lipped peccary (*Tayassu pecari*), a wild pig weighing 25 to 35 kgs. or so, Villavicencio, eastern Colombia. *Bottom, right:* Collared peccary (*Tayassu tajacu*), small wild pig of 15 to 20 kg., Anápolis, southern Goias, Brazil. (*Bottom, right*, courtesy Clark Yeager; others, courtesy R. M. Gilmore.)

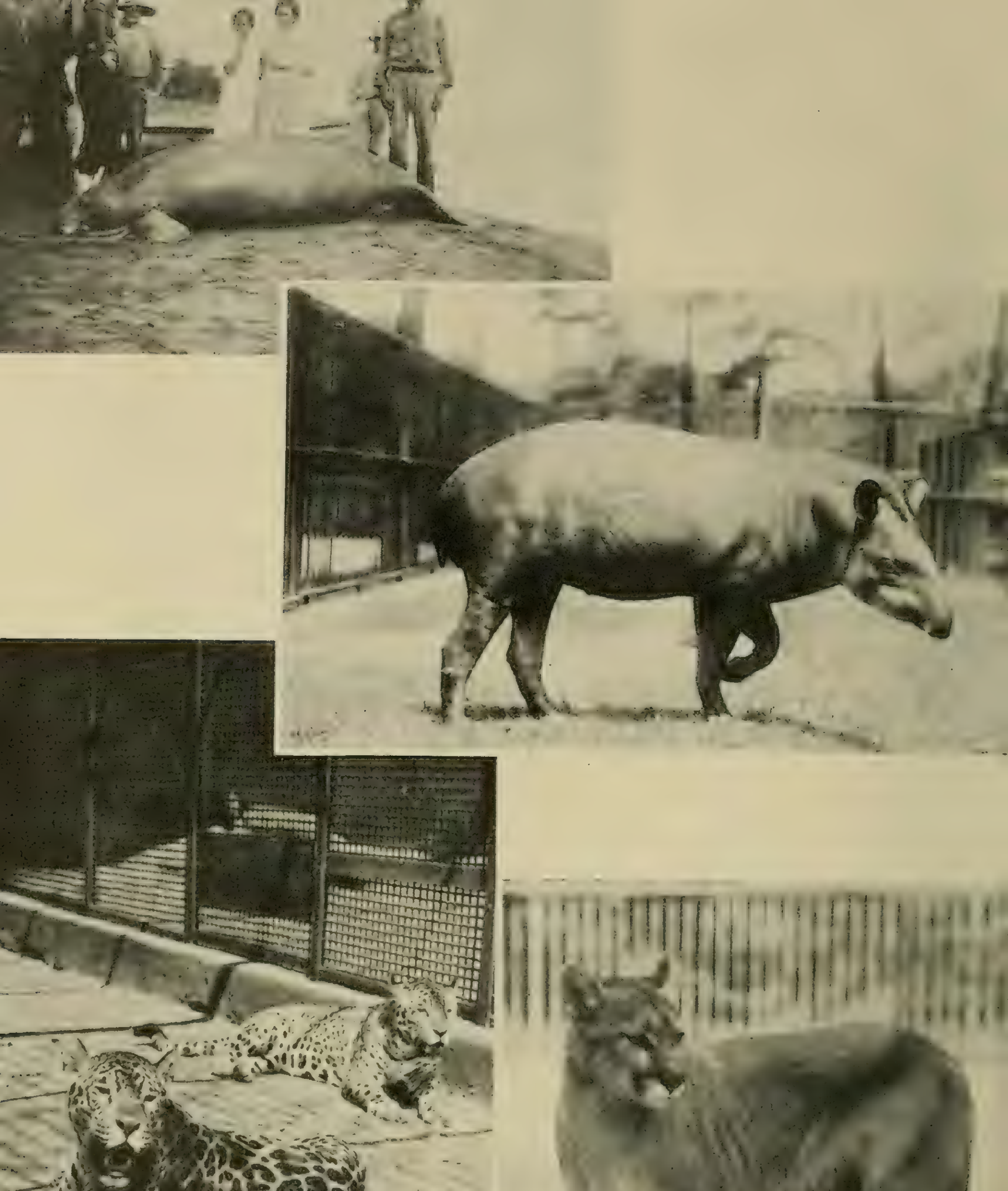


PLATE 39.—Manatee, tapir, and felids. *Top, left:* Manatee (*Trichechus manatus*), Graytown, Nicaragua. *Top, right:* Tapir (*Tapirus terrestris*), 250 to 300 kg. *Bottom, left:* Jaguar (*Felis onca*), 50 to 100 kg. *Bottom, right:* Puma (*Felis concolor*), 50 to 75 kg. (*Top, left*, courtesy O. W. Barrett; others, courtesy Smithsonian Institution.)

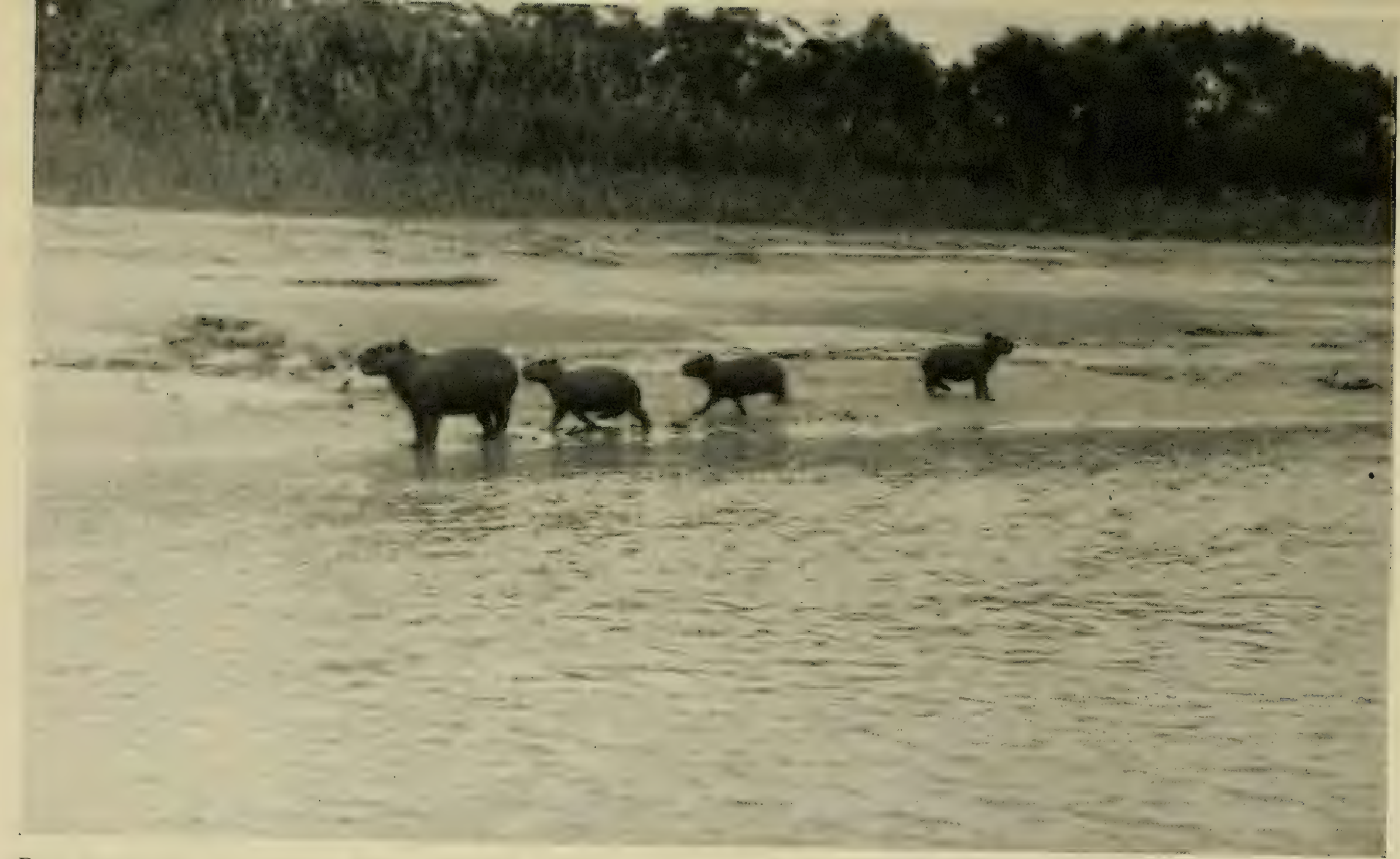


Plate 40.—Rodent. Capybara (*Hydrochoerus hydrochaeris*), size of pig, 50 to 75 kg. Madidi River, north Bolivia. (Courtesy Sulo Sihvonen.)

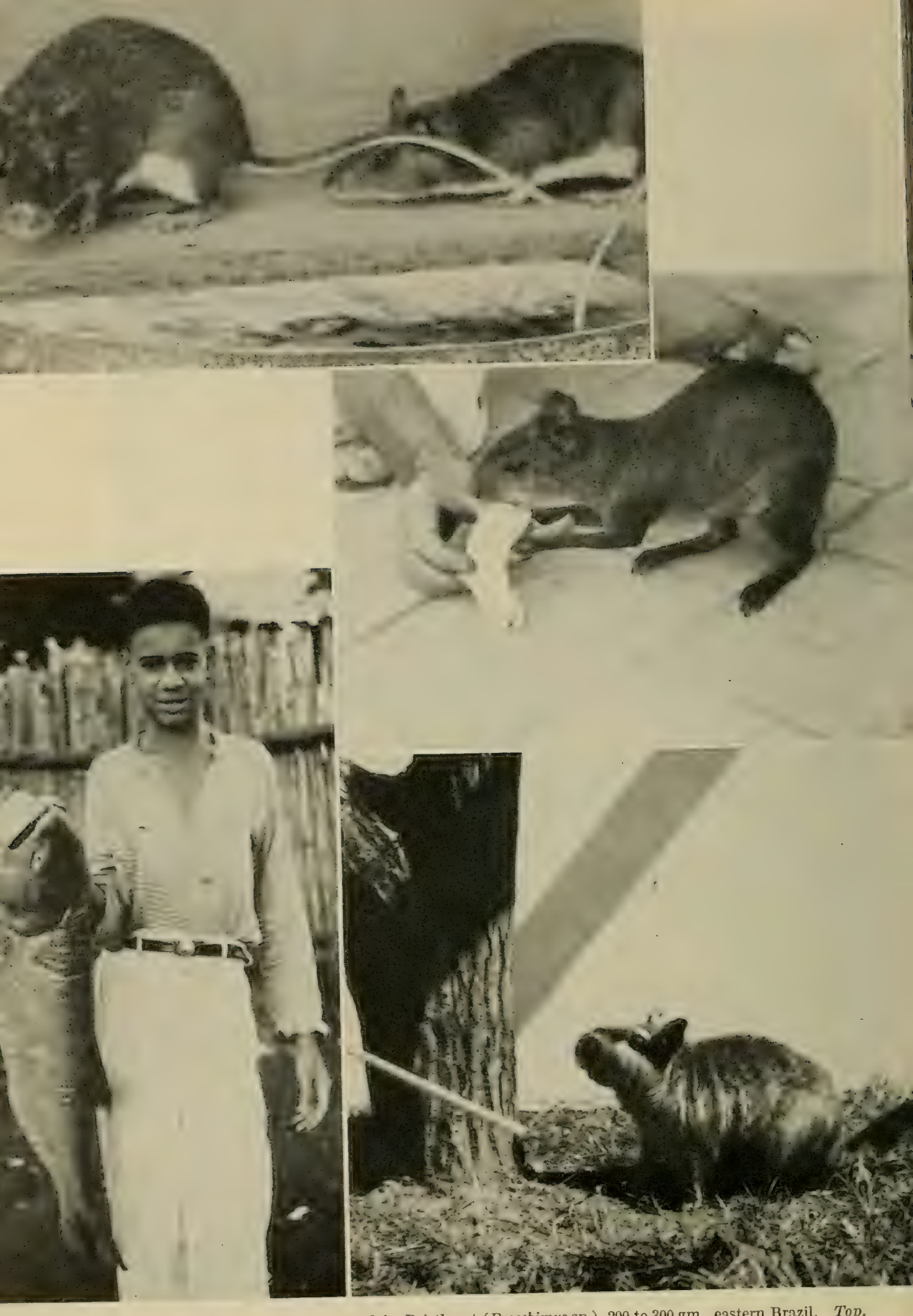


PLATE 41.—Rodents and fish. *Top, left:* Bristle rat (*Proechimys* sp.), 200 to 300 gm., eastern Brazil. *Top, right:* Agouti (*Dasyprocta* sp.), 2 to 3 kg., eastern Brazil. *Bottom, left:* Dourado (*Salminus* sp.), Rio Paraná, Brazil. *Bottom, right:* Plains viscacha (*Lagostomus maximus*), 5 to 8 kg., (*Bottom, right,* courtesy National Zoological Park, Washington; others, courtesy João Moojen de Oliveira.)

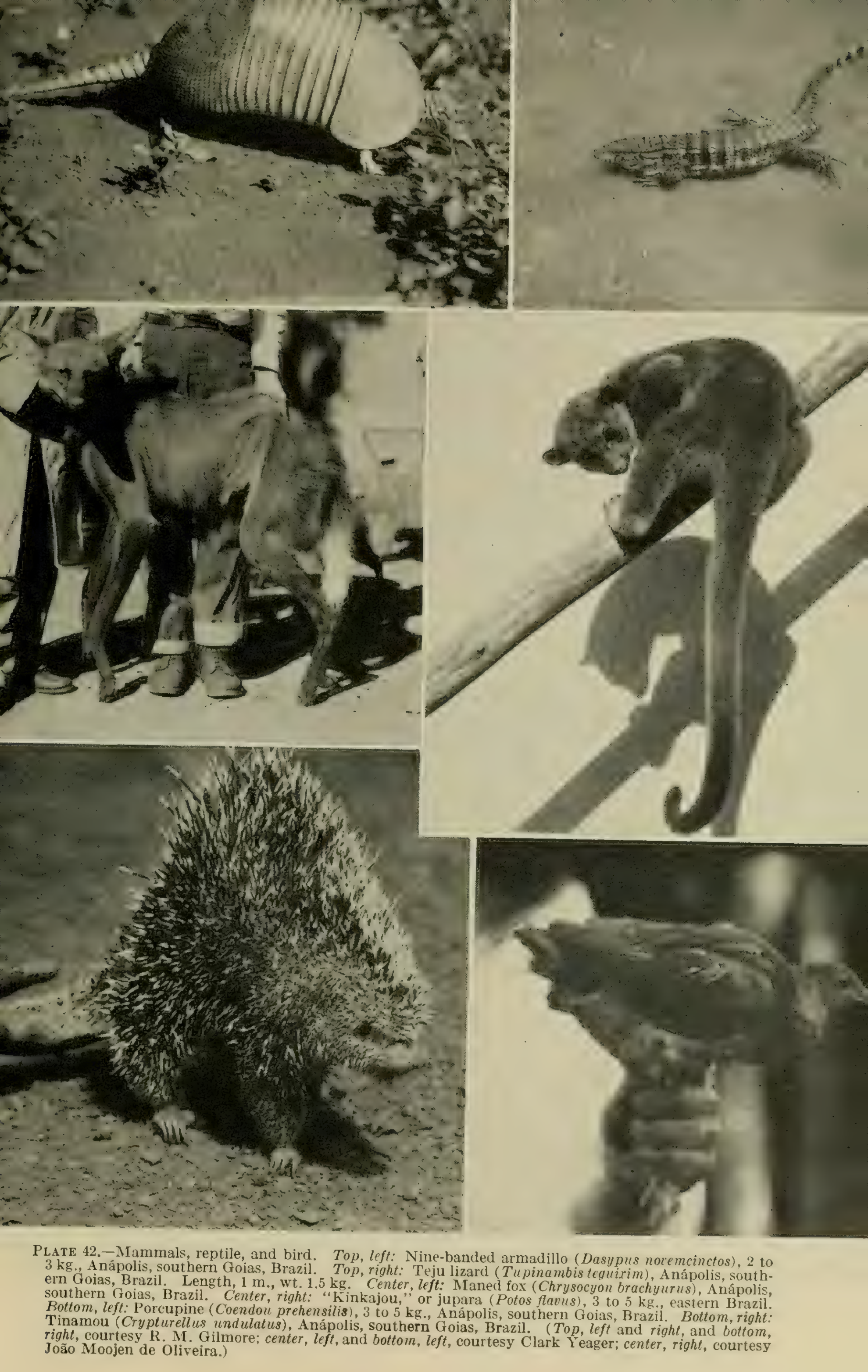


PLATE 42.—Mammals, reptile, and bird. *Top, left:* Nine-banded armadillo (*Dasypus novemcinctos*), 2 to 3 kg., Anápolis, southern Goias, Brazil. *Top, right:* Teju lizard (*Tupinambis teguixim*), Anápolis, southern Goias, Brazil. Length, 1 m., wt. 1.5 kg. *Center, left:* Maned fox (*Chrysocyon brachyurus*), Anápolis, southern Goias, Brazil. *Center, right:* "Kinkajou," or jupara (*Potos flavus*), 3 to 5 kg., eastern Brazil. *Bottom, left:* Porcupine (*Coendou prehensilis*), 3 to 5 kg., Anápolis, southern Goias, Brazil. *Bottom, right:* Tinamou (*Crypturellus undulatus*), Anápolis, southern Goias, Brazil. (*Top, left* and *right*, and *bottom, right*, courtesy R. M. Gilmore; *center, left*, and *bottom, left*, courtesy Clark Yeager; *center, right*, courtesy João Moojen de Oliveira.)

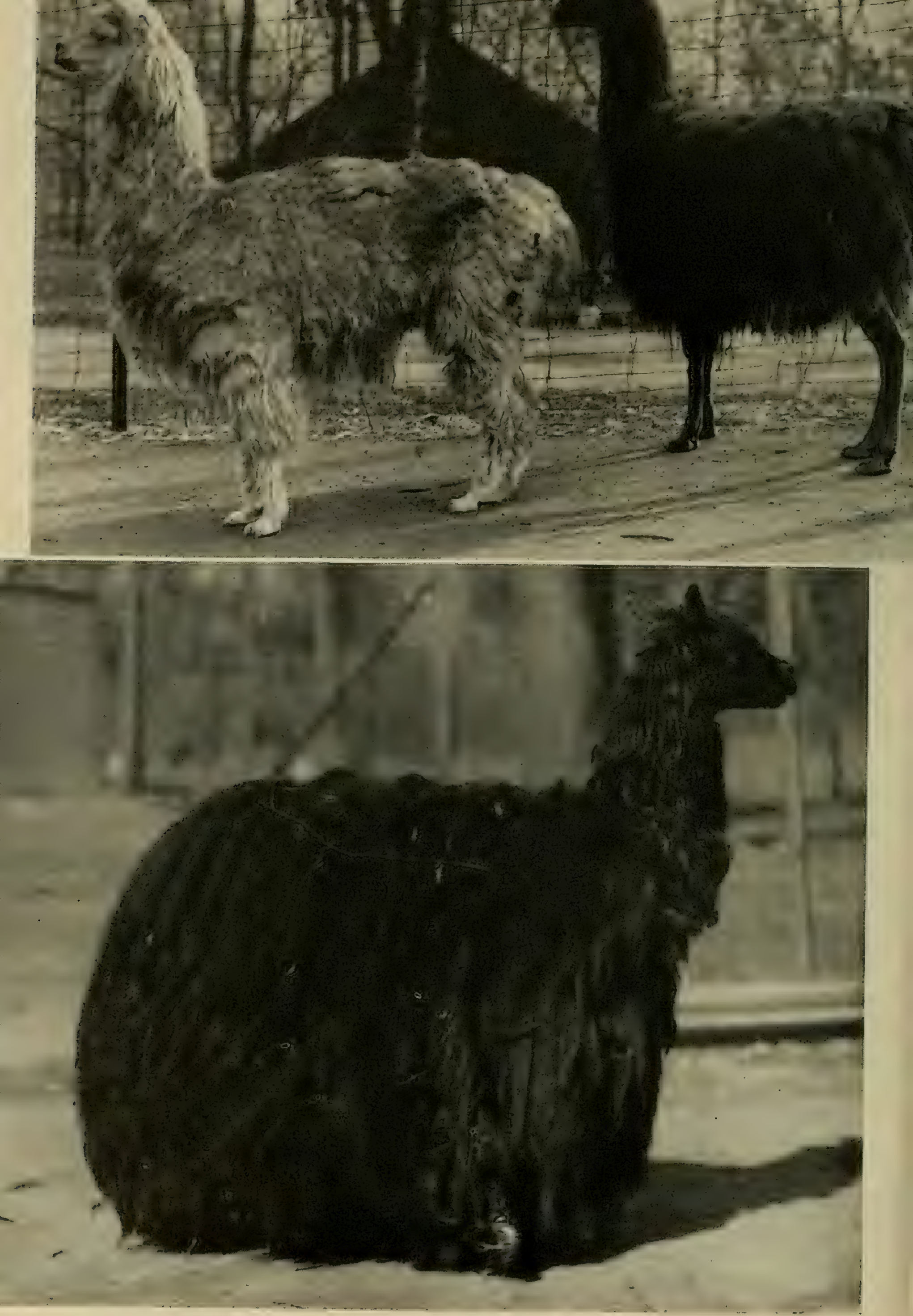
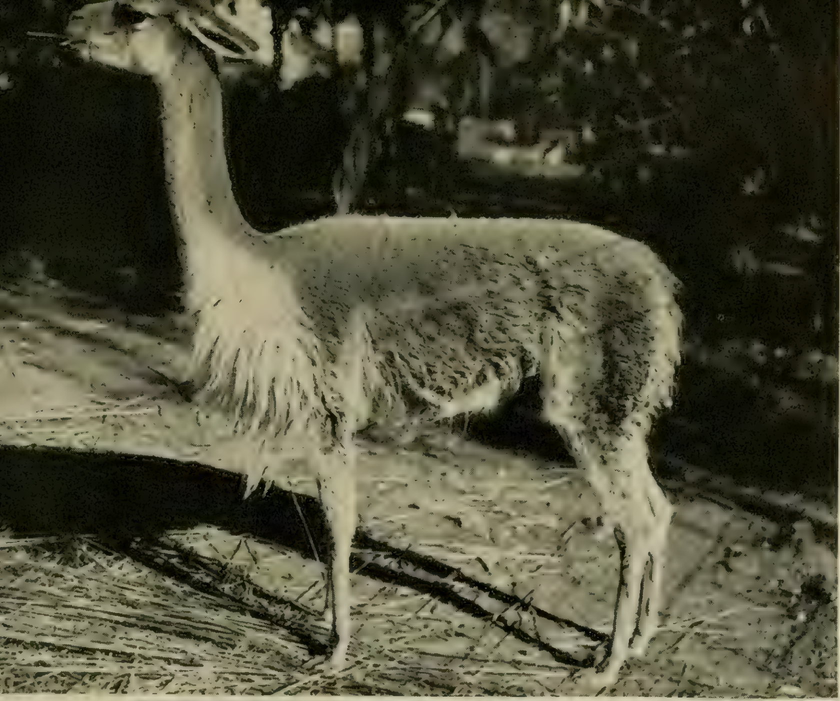


PLATE 43.—Llama and alpacas. *Top, right:* Llama (*Lama glama*); *left:* Alpaca (*Lama pacos*). *Bottom:* Alpaca. (Courtesy New York Zoological Society.)



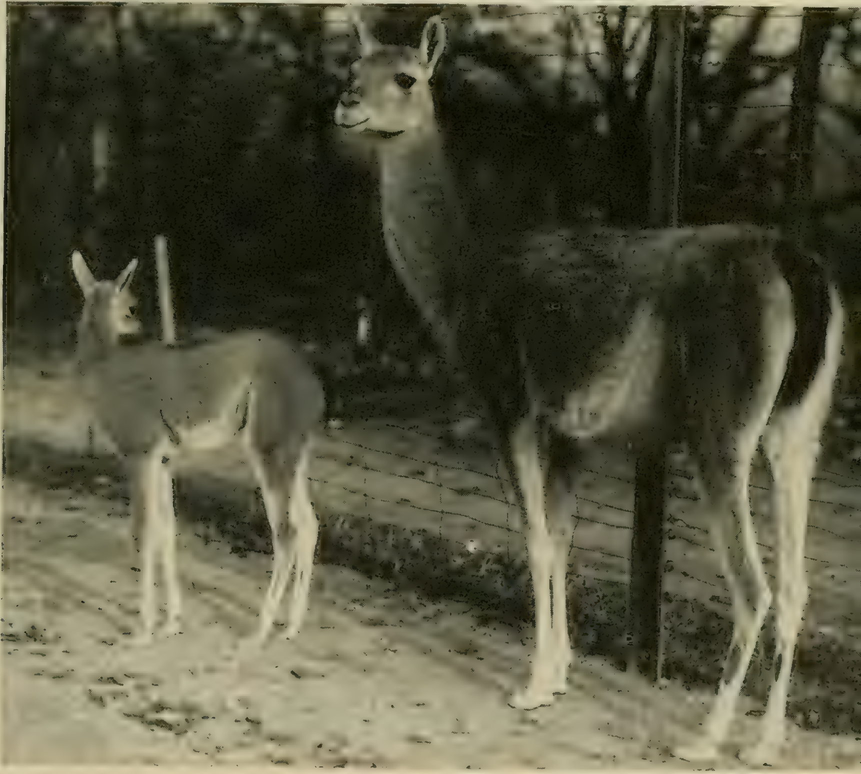


PLATE 44.—Vicuña and guanaco. *Top:* Female vicuña (*Lama*, or *Vicugna vicugna*) in Zoological Park, Sucre, Bolivia. *Bottom:* Guanaco (*Lama guanicoe*). (*Top*, courtesy R. M. Gilmore; *bottom*, courtesy New York Zoological Society.)

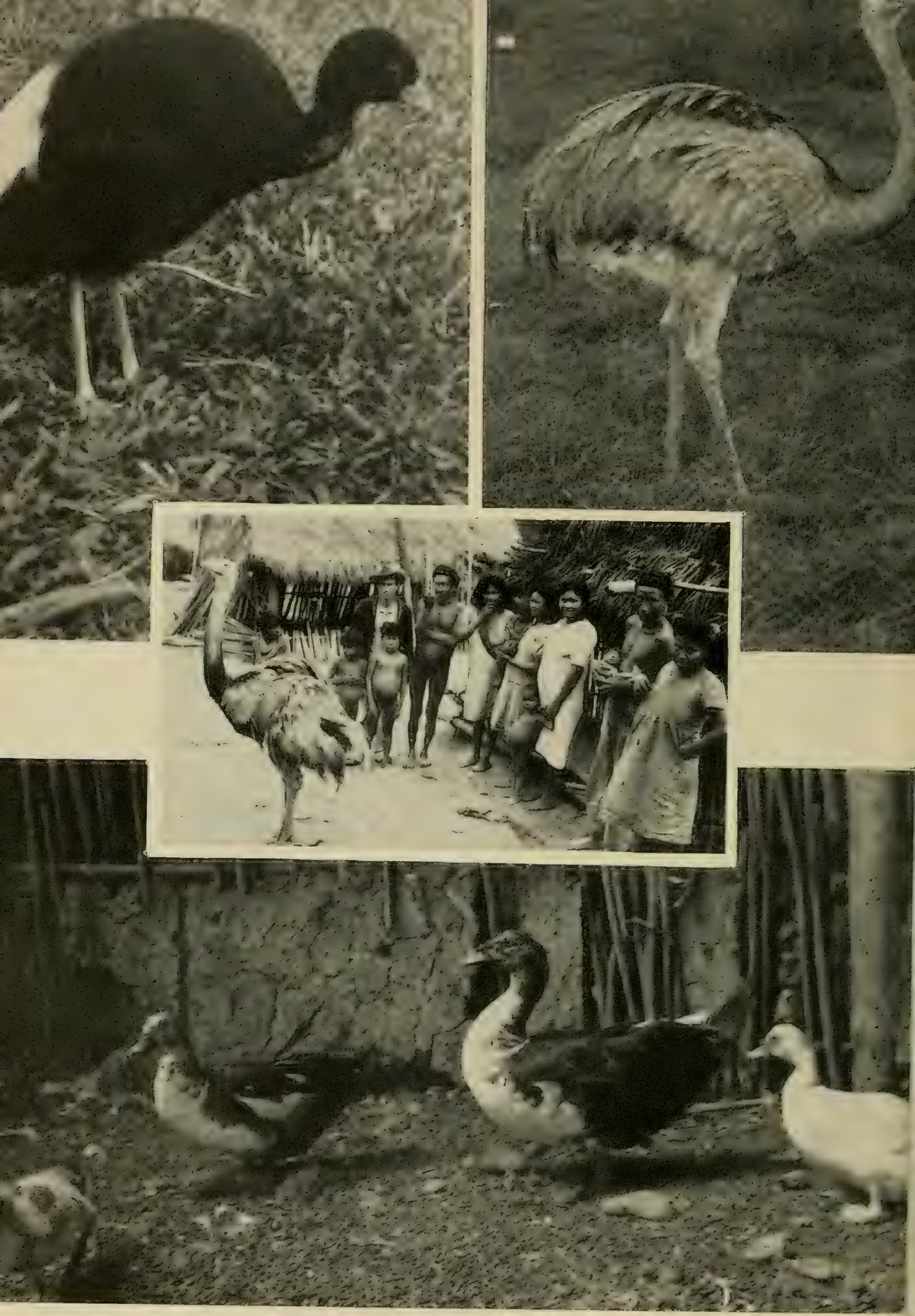


PLATE 45.—Birds. *Top, left:* Trumpeter (*Psophia leucoptera*), Riberalta, northeast Bolivia. *Top, right:* Young rhea (*Rhea americana*), Yacuiba, southeast Bolivia. *Center:* Adult rhea, tame, in Indian village, near Trinidad, eastern Bolivia. *Bottom:* Domesticated Muscovy ducks (*Cairina moschata*), Trujillo, Perú. (Courtesy R. M. Gilmore.)

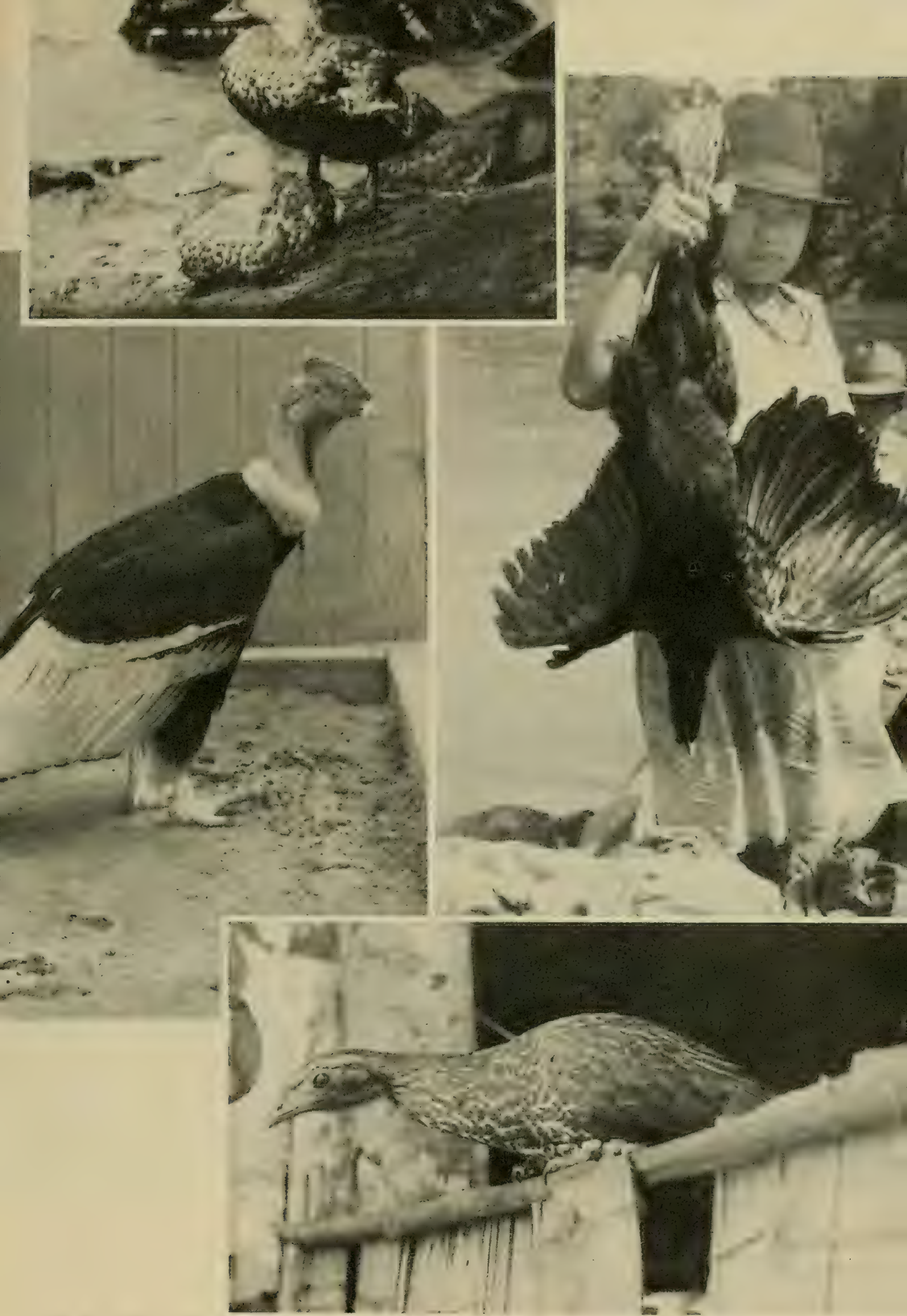


PLATE 46.—Birds. *Top:* Flightless steamer duck (*Tachyeres pteneres*), Hermite Island, southern Chile. *Center, left:* Condor (*Vultur gryphus*). *Center, right:* Razor-billed curassow (*Mitu mitu*), Madidi River, northern Bolivia. *Bottom:* Chachalaca, or guan (*Penelope superciliaris*), eastern Brazil. (*Top*, courtesy Rollo H. Beck and American Museum of Natural History; *center, left,* courtesy National Zoological Park, Washington; *center, right,* courtesy Sulo Sihvonen; *bottom,* courtesy João Moojen de Oliveira.)

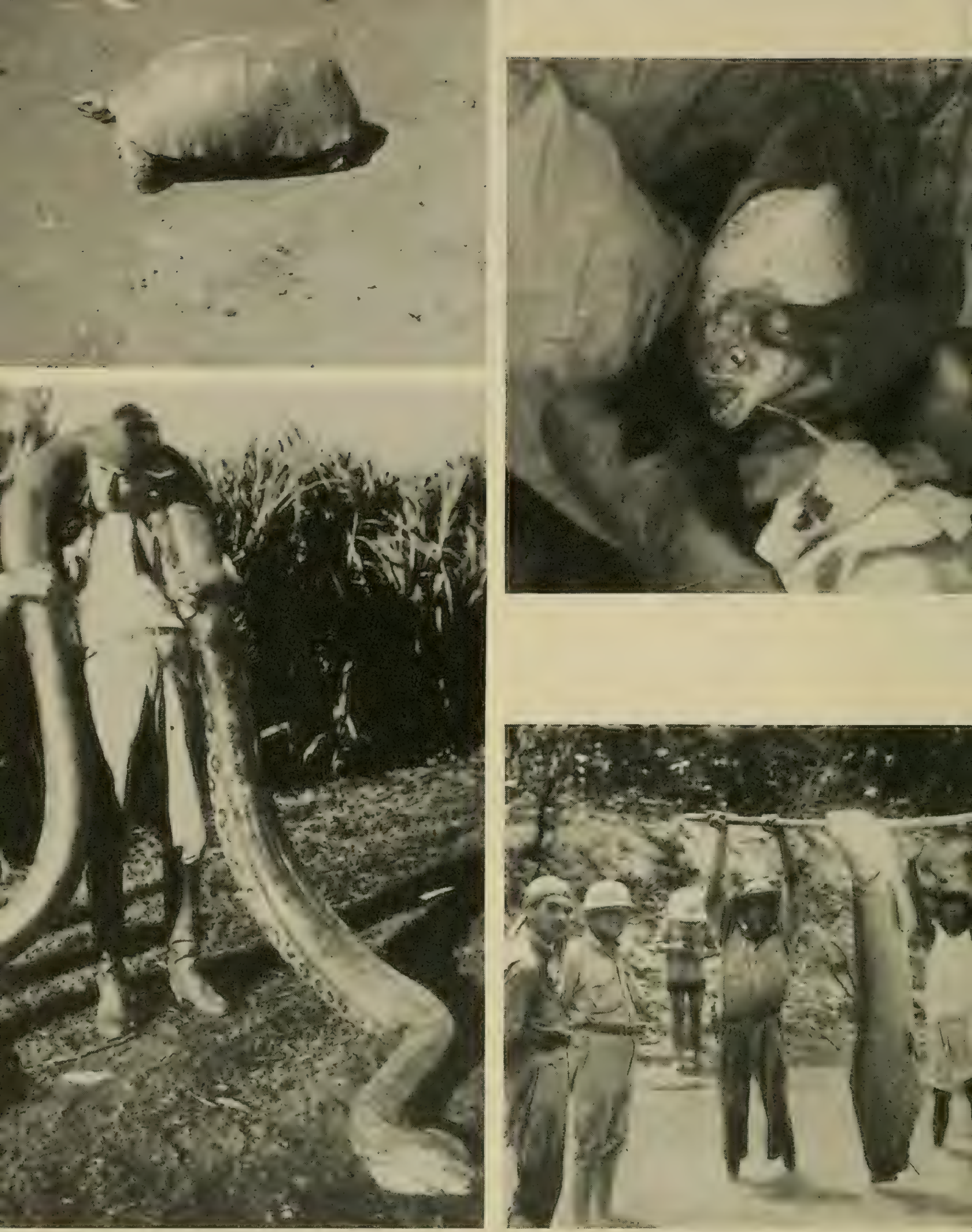


Plate 47.—Turtle, fishes, and snake. *Top, left:* Common tortoise (*Testudo tabulata*), 15 kg., Anápolis, southern Goias, Brazil. *Top, right:* Piranha (*Serrasalmus* sp.?) and piranha wound on man's foot, Ilha de Marajó, Brazil. *Bottom, left:* Anaconda (*Eunectes murinus*), Amazonas, Brazil. *Bottom, right:* Pirarucú (*Arapaima gigas*), Paraguay River (?), Brazil. (*Top, left* and *right,* courtesy R. M. Gilmore.)

(Rusconi, 1930). In the early Recent and late Pleistocene, animals, claimed to be indistinguishable on cranial characters from llamas, ranged in the nonglaciated intermontane valleys of the Andes (Tarija and Ulloma, Bolivia) and the eastern lowlands of Argentina and Patagonia (Lopez Aranguren, 1930; Cabrera, A., 1931).

Description (pl. 43).—*Size*: Averaging slightly larger than the guanaco; total length, 175–225 cm.; height at shoulder, 90–125 cm.; weight, 75–125 kg., smaller breeds along Peruvian Coast in *Inca* times, and at present in Ecuador. (See p. 437.) *Color:* Variable; generally black, brown, or white, or mixtures of these; some of "guanaco" color (light reddish brown dorsally and laterally, white ventrally and medially, and smoky gray brown on head); some spotted and even "maltese." *Pelage:* Heavy and long on body, slightly shorter on neck, very short on lower legs and head (abrupt change in length from body hair), almost bare on groin and axillae (sometimes depilated on rump and withers, because of cargo abrasion ?); composed of heavy, long, matty, slightly greasy wool hairs, 10–20 cm. if sheared annually, as long as 50 cm. (or 20 in.) if not sheared; wool hairs easily distinguished from overhairs (beard or guard hairs) scattered through the wool, which sometimes, in case of young animals, are longer than wool hairs and form a ridge on back of neck; no complete annual molt, but hairs continually growing and shedding like mane and tail of horse, though some individuals shed more hair in summer; at shearing time a tuft, "hualiaui," is often left on throat as protection against exposure (Stroock, 1937 a). Juvenile pelage, up to 4 or 6 months, of a fine, silky, short hair (3 to 10 cm., or 1 to 4 in.) without apparent dimorphism into wool and overhair. *Feet:* Large for group; fore larger than hind; each hoof with a small ridge along top, giving it a clawlike aspect. *Metatarsal glands:* Pair on each metatarsum (between hock and toes, on hind shank); clearly visible (uncovered by hair) and variable in shape and size, but generally oval and outer larger than inner. *Tail:* About 25 cm. (10 in.), heavily haired, and characteristically carried in an arc up, out, and down. *Ears:* About 15 cm. (6 in.), sparsely haired, and generally turned in at tips or slightly scalloped subterminally on inner edge to give turned-in appearance. *Callouses:* Absent except when produced on chest and legs by much kneeling in hard corrals. *Skull:* "Normal," like guanaco, though probably even more variable, especially in rostral length; large; facial portion in front of orbits usually longer by 10–15 mm. than cranial portion behind anteorbital border to rear of condyle; facial pits large; teeth large, P 3–4/4 and heel of M/3 relatively large, but endostyle of M/3 usually small; choanae variable, but usually narrow V, open V, or narrow U (rarely an open U); frontal profile slightly concave (greatly sunken in an *Inca* breed); lower incisors spatulate, rooted, imbricate (overlapping laterally), and with enamel on lingual and labial faces; symphysis of mandible long and narrow (as 2 : 1); submental foramina slightly anterior to menton (rear of symphysis). *Reproduction and growth:* Rut in summer; gestation 11 months (Maccagno, 1932, p. 45); one or rarely two young born the following summer; precocious, can rise and run in few hours; wean in 4 to 8 months; mature in 2 to 3 years; live 30 to 35 years (Romero, E. C., 1927), but in foreign zoos, 12 years normally, and as long as 20 (Flower, 1931, p. 223). Rutting probably not so sharply defined as in guanaco, and longevity probably longer as a usual result of domestication. *Hybridization*: Can be crossed with guanaco, alpaca, and vicuña, but only common hybrid is llama × alpaca, producing a huarizo or mixti, which is fertile; natural hybridization with guanaco probably rare, though producing fertile offspring (MacDonagh, 1940), and with vicuña more infrequent if at all, and offspring probably sterile. For discussion of huarizo and mixti, see page 445.

Intelligence: Low. *Disposition:* Generally calm, stolid, and "dignified" unless annoyed, then characteristically spray-spitting ("cough spitting"); often obstinate and sometimes panicky; curiosity pronounced; playful and affectionate when young. *Habits:* Greatly subordinated to man's activities and control; naturally herbivorous, gregarious, polygamous, with male dominance and dependence of female and young on male leadership; diurnal and nocturnal, and preferring high altitude and treeless, arid country; voiding dung and urine in communal spots (source of "taquía" fuel), and apparently often stimulated by sight of prior voider. *Diseases:* Liver flukes, and especially mange, which often sweeps through herds in epidemics causing many deaths and more morbidity; probably due to the llama itch mite (*Sarcoptes scabiei aucheniae*) and not to the llama mallophagan louse (*Trichodectes breviceps*). The belief that llamas have syphilis and transmitted it to the *Inca* herders through contact (zoophily ?), and hence to the Spaniards, who then brought it to Europe, is without foundation; no llama has been found to harbor *Treponema* (syn. *Spirocheta*) *pallidum*. *Voice:* Intermediate between a bleat and a moan (Cabrera and Yepes, 1940, p. 261); generally silent. *Special physiology:* Haemoglobin with high affinity for oxygen, red blood cells high (12.11 million per cu. mm.; Dill, 1938, pp. 127, 131), and probably a high efficiency in converting harsh and dry vegetation into carbohydrates for energy and metabolic water. *Breeds:* Several with vague characters; more in pre-Columbian times than today, one with five front toes (p. 437).

Remarks.—The llama apparently intergrades in all its morphology with the guanaco, though no one individual may show all intergradations, and they can be interbred freely, producing fertile offspring (MacDonagh, 1940). This supports the conclusion that the llama was derived from an ancient stock of wild guanaco. The much more restricted range of the llama (than that of the guanaco) can be explained on cultural rather than biologic grounds, as can be explained the failure of the llama to become established where it has been introduced into foreign countries (United States, Australia, Argentina, etc.). It breeds in North American zoologic parks. Even the evidence that the *Chimac* and the *Chincha* of Coastal Perú had Highland breeding grounds for their llamas (Estruch, 1943, p. 118) can be explained by the absence of artificial (and natural) pastures and cultivated forage crops along the coast.

However, herds of llamas existed on the coast of Perú in pre-Columbian times, as is shown by the many archeological remains and the numerous representations on pottery. (See Breeds, p. 437.) Maccagno (1932, p. 43) stated, without giving reasons for the custom, that llamas were brought from the Highlands to the Coast carrying human cadavers and were buried with their burdens; and that the Coastal climate was (ultimately ?) fatal to llamas. Pocock (1923), Lopez Aranguren (1930), and especially Cabrera (1931) contended that the llama was a distinct species, and the latter two authors identified fossils from Pleistocene deposits of southern South America as those of the llama. If these contentions are true, the llama can be considered a distinct species which became progressively a relict in the postglacial period, confined to the high mountains and weak in competition, and was saved from extinction by the fortunate combination of its zoologic status (?) and geographic range contiguous in time and space with a human culture which was well developed enough to domesticate the species. All the facts, however, do not fit any theory.

Origin.—On known distributional and archeologic evidence, the original domestication of the llama was made in or on the margins of the Central Highland area of southern Perú, Bolivia, North Chile, or Northwest Argentina. Latcham (1936 a, p. 611) localized domestication in the Highland around Lake Titicaca, and by the *Atacameño* before this tribe was driven south to North Chile by the bearers of Tiahuanaco culture.

Breeds.—There seem to be several vague breeds of llamas today: (1) Common llama; (2) large burden-bearing llama (?) of the Lake Titicaca region, and (3) small llama (?) of Riobamba, Ecuador. Definite data on these breeds are absent. E. C. Romero (1927) stated that there are two breeds in Northwest Argentina, "brachymorphics" and "dolichomorphics," but he intimated later in the same paper that the latter are llama-alpaca hybrids (although one would suppose that alpaca blood would give a brachy effect).

In pre-Columbian times, in the Highlands and on the Coast of Perú, there also existed several breeds, some as indefinite as those today: (1) Small llama on the Coast (definitely not an alpaca; specimens seen from Pachacamac, south of Lima); (2) normal-sized llama with sunken forehead from the Coast (specimens from Pachacamac); (3) large burden-bearing llama (?) of the Highlands, utilized especially by the *Inca* army; and (4) aberrant llama with five front toes from Chancay, Central Coastal Perú.

One complete skeleton and two baked-clay figurines of the five-toed llama were examined in the Museo Nacional de Antropología, Lima, Perú, through the courtesy of Dr. Tello, the director, who has kindly given permission to describe the animal here.

The extra front toes were the 1st, 2d, and 3d; the 3d and 2d arose from progressively shorter additional articulation facets on the medial side of an otherwise normal metacarpal (front metapodial, or cannon-bone); and the 1st toe was represented by a short, closely appressed "dew-claw" situated above the 2d on the inside of the leg, and seen on the figurines only. The color of the figurines was black above and white below; the color of the skin fragments found with the skeleton was, according to Dr. Tello, dark brown above and white below. This breed was undoubtedly a rare mutation, possibly saved for religious purposes or mere curiosity. Strangely, this mutation does not recapitulate phylogeny which is clearly shown, by the long Nearctic Tertiary fossil record, to have involved a loss of digits 1, 2, and 5, leaving 3 and 4 existing today in normal lamoids.

The "chilihueque" of North Chile was probably the common breed of llama, and was employed as a water carrier (Cabrera and Yepes, 1940, p. 263). Such southern range indicates diffusion by the *Inca*. Marelli (1931, p. 54) listed "chilihueque" under alpaca.

Aboriginal use.—In aboriginal times in the middle Andean region, the llama was very important ethnozoologically. It was used as a beast of burden, as food, sacrifice in religious ceremonies, and as a source of fuel (dung, or taquía), medicine (bezoar stones), wool, and hide. The animal thereby constituted a prime source of wealth, both for the individual and for the state (*Inca*). The success of the *Inca* conquests undoubtedly was partially dependent upon the llama as a burden-bearing and emergency food animal.

The llama was never ridden, milked, or used for wheeled drayage. (The wheel was unknown in pre-Columbian America.) The llama can be mounted, but it is probably too small for continued riding. No animal was milked by American aborigines, and even after the Spaniards introduced milking with cows, no extension of the custom was made to llamas (nor to alpacas). There are hints that the llama may have been used for plowing or travois drayage, though such is doubtful. Romero (1927, p. 63) denied an assertion of "Teodoro Bry" on plowing, and Bennett's record (Handbook, vol. 2, p. 607) of "toggles for llama harnesses" may indicate use for burden bearing rather than some kind of draft.

Today, in high Perú and Bolivia, the llama is still very common, and though it is generally inferior to, and has been replaced partially by the burro and mule as a pack animal and the sheep and alpaca as a wool producer, it has remained numerous and important, probably because of (1) its combination as a burden-bearing, wool, meat, and dung-fuel animal, (2) its tolerance to altitudes probably higher than mules, burros, or horses can endure, and (3) the conservatism of the Indian. Maccagno (1932, p. 50) stated that the llama will disappear if not improved in quality and husbanded with care.

Cargo transportation.—Today llamas are used mostly for transportation of cargo, and probably were likewise used in pre-Columbian times. They carry agricultural produce from Highland farms to centers of population and return with other goods, principally salt or coca. Sometimes large caravans make long trips. In Colonial times, 350,000 llamas were used for transporting metals alone, mostly silver, from remote mines (Maccagno, 1932, p. 49).

The cargo appears to weigh from 10 to 50 kg., or 22 to 130 lbs. (45 to 80 kg., or 100 to 175 lbs., Maccagno, 1932, p. 28; but later he stated, p. 48, 25 to 60 kg., or 55 to 132 lbs.), depending on the size and strength of the individual llama and the exigencies of the moment. Overloading is said to cause the animal to lie down and refuse to rise until relieved of some weight.

The daily travel is from 10 to 30 km., or 6 to 18 miles; the pace is slow, and the group is as often bunched as in file. An entire journey may be several hundred km. Maccagno (1932, pp. 28, 48) said that llamas travel 6 to 7 leagues (30 to 35 km. ?), can march 20 days steadily, and go 5 days without food (and water ?). The degree of thirst tolerance is not known, but it is believed to be high. Romero (1927, p. 44) stated as a proved fact that llamas can pass (work ?) 3 or 4 days without drinking. Water probably is derived, during forced abstinence, from carbohydrates and subcutaneous fat, not from a supply in the so-called "water-cells" of the rumen.

There is usually one herder for every 15 to 20 animals. No frame packsaddles are used, but only a blanket, and the load is tied with plain rope without a cinch girth of canvas. The heavy wool on the back is not sheared but allowed to grow long, presumably for easing the burden.

Llamas can find food even in the most desolate-appearing country, and grazing is done on the march; or at night when they are often turned loose. Stabling is done in stone corrals, or by securing a group in a circle with a neck rope, heads inward and kneeling. Also, it is stated that a llama will not pass a single-strand rope fence (Maccagno, 1932, p. 49).

Wool and weaving.—The wool of a llama is strong, though greasy and relatively coarse and with a considerable amount of stiff guard hairs. It is usually plucked from the llamas by hand while on the march, and spun on hand spindles by the walking women soon afterward. In some places, flocks seem to be sheared regularly every 2 years (to get a greater length of fiber than with annual shearing), beginning at the second year (Cabrera and Yepes, 1940, p. 263). Yield from one animal is 1,800 to 3,500 gm. (4 to 8 lbs.) and at the end of the second year the fibers reach a length of 30 cm., or 12 inches (Maccagno, 1932, p. 28). Part of the required labor of indentured *Aymara* and *Quechua* Indians on haciendas is the weaving of blankets and rugs on large wooden looms from llama wool supplied by the Indians. In *Inca* times llama wool was used extensively by the common people for fabrics; the better wool from alpaca and vicuña was reserved for the upper classes (Maccagno, 1932, p. 47).

Meat.—Llama meat is said to be tasty, especially when from a young animal, but apparently it is little utilized today; perhaps sheep are too plentiful. In *Inca* times, probably the principal source of meat was that of llama, and it was often dried to form "charqui." Maccagno (1932, p. 47) stated that fresh entrails and blood were relished, and that herds were driven to the Coast for slaughter and were taken with the armies to supply meat; also that the Spaniards relished the brain, and slaughtered thousands from special herds which were kept for this purpose (op. cit., p. 45).

Hides.—The use of llama hides is not indicated except for sandals in *Inca* times (op. cit., p. 48); but it seems that the hide may have been used more extensively, even though there is no indication that the tanning art was developed.

Dung fuel (taquía).—Llama dung is a common fuel on the treeless altiplano of Bolivia and South Perú. The bolus is small, about 2 to 3 cm. (¾ to 1 in.) in diameter, like that of a sheep, but it is deposited in communal voiding places and is thus gathered easily. When the llamas are on the march or billeted for the night, the act of defecation of one animal seems to be stimulated by that of another. The alpaca, guanaco, and vicuña have the same habit.

This use of llama dung for fuel may be a relatively recent custom and may be correlated with the deforestation and general vegetational depletion of the Highland area in the past several millennia. Today the resinous tola bush (Compositae) also is used in some places for fuel, and has become scarce or extinct in easily accessible areas.

Husbandry.—Today llama husbandry is entirely in the hands of the Indians, both *Aymara* and *Quechua*, and the technique is usually simple. Many Indians have their own herds, which are kept in corrals or allowed to graze under the eye of a watchful child. Breeding is indiscriminate, without selection, and many alpaca-llama hybrids seem to be present. Males and females are used for burden bearing, and castration is not practiced to any extent.

However, some herds are better managed (probably those of the larger haciendas and the property of the haciendado), and Maccagno stated (1932, pp. 49–50) that herds are divided into "extremas" (8 to 24 months), "ancutas" (2 to 3 years), "puntas de anachos" (breeding males over 3 years), "puntas" of burden-bearing llamas (males over 3 years), "puntas" of females with young, and "puntas" of females without young. For each 100 females, 2 to 10 males are designated. The females breed at 3 years of age. Castration is not generally practiced, though it was commoner in Colonial times for burden-bearing males. Tschudi (1844–46, p. 259) stated that castration was practiced by the Indians to obtain a savory meat and long wool.

In *Inca* times llama husbandry was a complex and honored profession. Maccagno (1932, quoting earlier sources) stated that the herds belonged to the Dynasty (the *Inca* Emperor or his family), the Sun, the Temples, and the Huacas (burial grounds):

> On certain occasions, particularly after a successful [military] campaign, gifts were made among the Kuracas who received 1,000, 500, 100, 50, 20, and 10 llamas each [according to rank], and some Indians were given a pair.
>
> The mayordomos ("l'ama kamayox") of the Dynasty of Sun herds ("kapax l'amakuna," or "kapax l'ama") were generally men of distinction, and sometimes

> princes of royal blood. They had under their orders many shepherds ("l'ama nitsix") who directly attended the herds. By means of quipus they counted exactly the number of llamas in each herd, and each herd had its corresponding color on the quipu. [Maccagno, 1932, p. 44.]

He also stated that the division of *Inca* herds was as follows: Young, 4 to 12 months ("uñakuna"); young, 1 to 2 [3?] years ("malta una"); breeding males over 3 years, according to colors ("apukura"); cargo males, according to colors ("wacaywa"); breeding females, by color ("tsina"); and sterile adults (females only ?), by color ("komi"); also, that castration was not known.

Religious ceremony.—The llama was very important in *Inca* religious ceremony.

> The animals for sacrifice were taken from the Sun or Huaca ("Waka") herds, according to the object of the sacrifice. . . . [The kind] most appreciated by the Peruvian *Incas* were the pure black llamas. . . . Contrary, the Kollas [Aymara-speaking Indians of Lake Titicaca] appreciated more the white. . . . At the principal temple, Korikautsa, in Cuzco, every morning one white llama was sacrificed; it was sheared to facilitate stabbing with a stone or copper knife in the heart. Each month at least 100 were sacrificed, and at large festivals, 1,000 or more. [Maccagno, 1932, pp. 44, 46, quoting earlier unnamed sources.]

Garcilaso de la Vega (Markham's ed., 1869, 2: 376–380) said that at the Yntip Raymi festival in "June," pure black llamas were sacrificed with other llamas, lizards, toads, serpents, foxes, tigers [jaguars], lions [pumas], and many birds. He also stated that such use of animals prevented widespread human sacrifice (ibid., p. 131).

Certain star constellations were sacred to llamas: Lira for the male, and Cygnus for the female and its young (Cabrera and Yepes, 1940, p. 262).

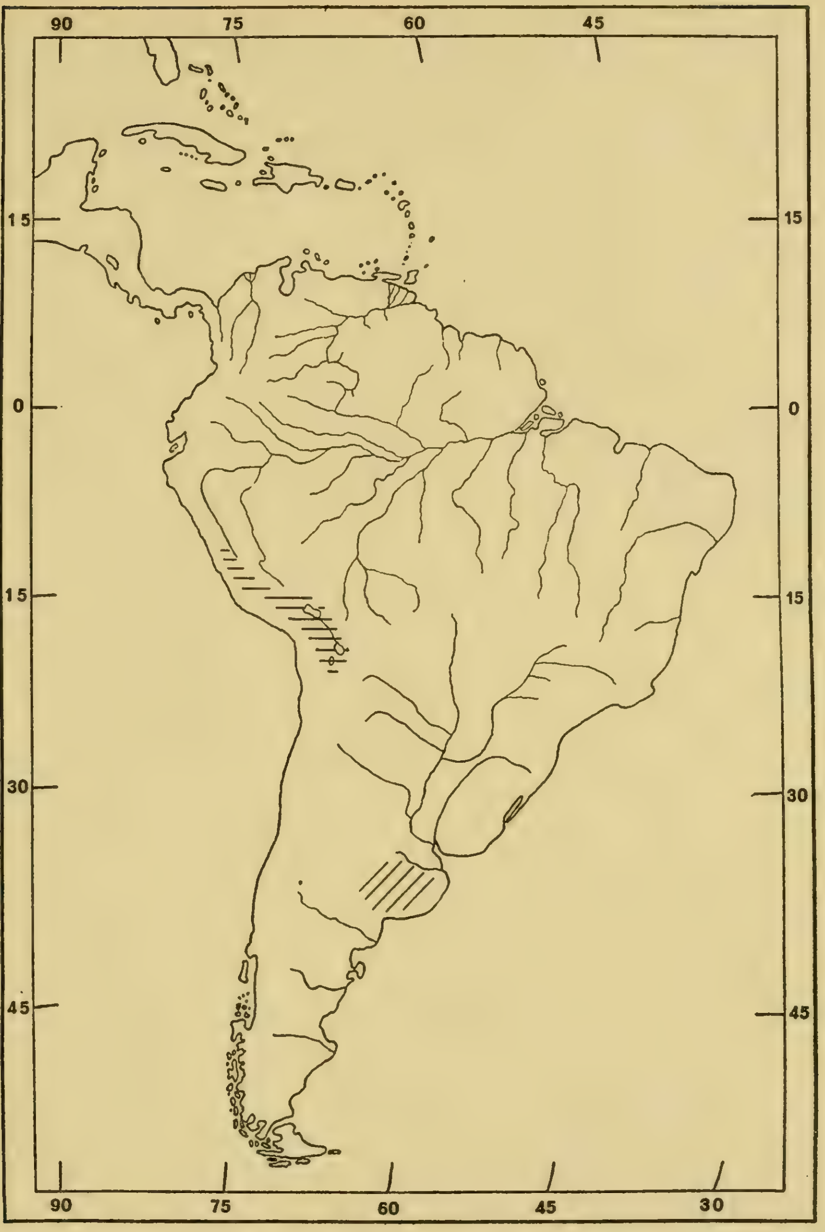
Remains of llamas, as well as clay figurines, are common in the *Inca* burial mounds. Evidently the llamas were buried to supply food for the deceased. Maccagno (1932, p. 47) stated that the small llama figurines generally had a round hole in the back, some 5 to 10 mm. (0.15 to 0.30 in.) deep, that the wool was indicated by markings and the tail shown in a vertical or a horizontal position, and that some silver images have been found with a gummy matrix in the eye sockets, which once must have contained precious stones.

Medicine.—The bezoar (gastric calculus) of the llama was prized, at least in Colonial times, as a specific remedy for certain ailments.

Lama pacos: Alpaca

Distribution.—At present the alpaca is found in the domesticated state only and is restricted to southern Perú, adjacent northern Bolivia, and extreme North Argentina. Formerly, in historic times, the alpaca ranged as far south as Catamarca, Argentina. In early Recent and late Pleistocene times (?), it is alleged to have occurred on the Humid Pampas of Argentina near Buenos Aires (map 13). (See Lopez Aranguren, 1930; Cabrera, 1931.)

Description (pl. 43).—*Size:* Smaller than llama; total length 150 to 175 cm. (58 to 68 in.); height at shoulder 80 to 90 cm. (31 to 35 in.). *Color:* Generally pure brown or black, but in some pure white; rarely multicolored. *Pelage:* Long and heavy over body, neck and top of head, chest, belly, and upper legs; short but thick on face (often, however, obscured by the long forehead hairs) and on lower legs (obscuring metatarsal glands); almost bare on axillae and groin; length about 40 to 50 cm. on body (obscuring tail), and sometimes hanging to ground (suri breed); composed mostly of long, fine wool hairs which are slightly curly and greasy, and mat in heavy clumps. The wool hairs are not shed en masse annually, but individually at different times (like human hair, horse's mane and tail), and the fibers are said to reach a length of 75 cm. when allowed to grow over many years (probably suri breed only). The wool of the common huacaya breed has a density of 90 to 100 fibers per sq. mm., and the yield is 2 to 3 kg. per animal; in the suri breed, density is from 140 to 170 fibers per sq. mm., and the yield is 3 to 5 kg. per animal (Maccagno, 1932, p. 27). Wool of the alpaca, strangely, is more closely allied to true hair (more medulla and scales) than is true wool of sheep, and more so than llama and vicuña wool (Bowman, 1908, pp. 232–234). *Tail:* Short 20 to 25 cm. (8 to 10 in.) and obscured by heavy long body and tail hairs; said not to be carried out and then down in arc as in llama (Romero, E. C., 1927). *Feet:* Small; fore larger than hind. *Metatarsal glands:* Present on hind shank as on other three species, but completely concealed by hair (as in vicuña); size about as in llama. *Ears:* Longish, 12 to 15 cm., and broadly lanceolate (not scalloped). *Eyes:* Large. *Mammae:* 4 functional (1 nonfunctional). *Skull:* Medium; in size between llama-guanaco and vicuña; and with features of both (appears to be a combination of small skull of vicuña with large teeth of llama); facial portion short, about same length as cranial portion; facial pits small or absent, teeth large, P 3–4/4 relatively large; lower incisors with enamel on labial and lingual faces and rooted, though some become very large, and these evidently have grown persistently from pulps which remained open longer than usual, and have not been worn properly; choanae generally open U; symphysis of mandible generally long and narrow; submental foramen 5 to 15 mm. anterior to root of symphysis (menton). *Reproduction:* Like llama. *Longevity:* To 15 or 17 years (av. 12; Flower, S. S., 1931, p. 223), probably longer in native land and out of zoos, though individuals are considered old at 7 years, and then usually killed for food (Maccagno, 1932, p. 35). *Hybridization:* Possible with any of other three species of lamoids, but common with llama only, producing huarizo and mixti, and secondarily with vicuña, producing paco-vicuña (or vicuña-pacos) which are doubtfully always fertile. *Intelligence and disposition:* Like llama; and though some authors say that they are less playful and tamable when young (Romero, 1927); others state the opposite. *Habits:* At present (in domestication), like llama, except for alleged preference for wet and marshy ground of higher altitudes (Romero, 1927; Maccagno, 1932, p. 37), and for alleged greater dependence upon companionship (Tschudi, 1844–46, p. 26). The preference for marshy ground is said to be a function of the "soft" feet, and to result in small size of the animal because it eats the "poor and rachitic" vegetation in these places. Both assumptions are applied to the vicuña also, and both appear to be questionable. This close dependence upon water is said to be responsible for great losses during prolonged dry spells, and may be an ecologic barrier which has restricted the range of the animal. Tschudi (1844, p. 261) stated that the alpaca will not suffer a lone existence and must have the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MAP 13.—Distribution of the alpaca. (*Horizontal hachure*, present range; *diagonal hachure*, Pleistocene.) (According to Lopez Ananguren, 1931, and Cabrera, 1932.)

companionship of other alpacas or llamas. *Diseases:* Probably like llama; also afflicted with a specific acute chronic fever of diplococcic or streptococcic origin, which often is called "syphilis" (Preston, 1939, pp. 28–29), perhaps giving rise to the story of the derivation of syphilis from llama and alpaca; however, no spirochetes have been found in alpaca lesions. *Breeds:* Two; common, or "huacaya," and "suri"; both breed true. *Special physiology:* See below.

Remarks.—The alpaca is the most restricted in range, and perhaps the most specialized of the four lamoids. It appears to be on the decline in numbers. In its physiology, it is probably the best adapted to high altitude; the normal pulse is high, 54 to 100 per minute; respiration rate high, 20 to 40 per minute; blood count very high, 20 million red blood corpuscles per cu. mm. (6 to 8 million for other domesticated animals and man at high altitudes, though sheep have been recorded with 10,530,000 (Dill, 1938, p. 131)); blood coagulates rapidly (Preston, 1939). These data indicate that most alpacas may have difficulty in adapting themselves to lower elevations, though they live long and breed in North American zoos. Their apparent dependence upon water has been mentioned above.

The alpaca is considered here as a probable distinct species. It is known in the domesticated state only, though some feral herds were said to exist by Tschudi (1844–46, p. 261). As the usual alpaca skull is distinctive enough to accept easily the identification by Lopez Aranguren (1930) and A. Cabrera (1931) of the species in the Pleistocene of Argentina, the alpaca may be considered a woolly Pleistocene relict, which became progressively more restricted in range and weaker in competition, losing its adaptive plasticity, until, shortly before extinction, some were integrated into human culture, which fortuitously was at a proper high level in the same region. J. A. León (1939) believed that the alpaca was domesticated later than the llama, when a higher civilization could use the wool; but he did not commit himself definitely as to the biological origin of the alpaca. Bowman (1908, p. 332) believed, after a study of hairs of llama, alpaca, and vicuña, that the alpaca was probably a "mere variety of the llama" (despite his assertion that the wool of the alpaca was more hairlike than that of the other two tested).

The vicuñalike characters (concealed metatarsal glands, short snout, open-U choanae, and especially the long and continuously growing incisors from incipiently open rooted incisors) suggest hybrid origin for the alpaca from llama-vicuña crosses. But this is not necessarily true. The alpaca cannot be crossed easily with the vicuña, and the offspring are not unequivocally fertile, and when able to breed inter se, the hybrids soon revert to either parent. The vicuñalike characters are quite constant, and may be validly specific.

Origin.—The history and present distribution of the alpaca indicate that the Highland altiplano area around Lake Titicaca was the hearth of domestication.

Breeds.—Two breeds of alpaca are known today and both are of pre-Columbian origin: (1) common or "huacaya," and (2) "suri." Both breed true. The suri is distinguished by its longer and finer wool.

The alpaca is involved in the two common hybrids among lamoids: (1) Alpaca × llama = "huarizo" (female alpaca × male llama = "mixti"); (2) vicuña (male) × alpaca (female) = paco-vicuña. The huarizo is common but apparently does not breed true (Romero, E. C., 1927, pp. 25–26); in time, hybrid crosses inter se revert to parent types. Many apparent hybrids between llamas and alpacas, or at least llamas with alpacoid characters, are to be seen today in Bolivia, and it would seem that the two forms interbreed readily, or that genetic variation in the llama often tends toward the alpaca. Maccagno (1932, p. 57) stated that huarizos were common because the llama and alpaca interbred freely without help from man. However, E. C. Romero (1927, pp. 25, 27) indicated that the hybrids showed no fixed characters, and had to be perpetuated by parental crosses. The breed presents no advantage, except to combine a cargo animal with one of good wool production.

The paco-vicuña has been well known since the Conquest, and Maccagno (1932, p. 54) stated that they have been produced from time immemorial without intervention of man, but the statement would appear to require some proof. These hybrids today are deliberate results of attempts to establish a breed with wool of high vicuña quality and of high alpaca quantity. After the first shearing, the wool of paco-vicuña loses its fine quality, and the guard hairs increase; also, herds of up to 300 have been produced in the last half century, but the owners declared that they had no commercial value because the suri alpaca breed was superior (ibid., p. 56).

Such attempts at hybridization are still in progress, though none has been signally successful because of the alleged infertility of some of the hybrids, or because of the return of the hybrid crosses to parent types, together with the lack of desired wool production. Famous is the first recorded attempt to establish a paco-vicuña breed. A priest, Cabrera, in Macusani, Puno, South Highland Perú, labored with patience and perseverance for 21 years (1821–42) and obtained 20 tame paco-vicuñas. For this "new richness," Perú rewarded him; but the hybrids became extinct, either because offspring crosses to the third generation reverted to alpaca or vicuña types (Maccagno, 1932, p. 54) or because all or most of the hybrids were sterile (Alvina, 1872; and Arinibar, 1906; quoted by E. C. Romero, 1927, pp. 26–27).

Even earlier than Cabrera's attempt, was that of the Spanish at

San Lucar de Barrameda, Andalusia, Spain. Here M. Bouy de Saint Vincent, a naturalist with the French invasion army under Marshall Soult during Napoleon's campaign on the peninsula, saw three "alpa-vigonias" with long heavy fleeces. These hybrids the Spanish thought would replace their declining flocks of Merino sheep, but unfortunately they left no descendants, being apparently sterile (B[rowne], 1858, pp. 69–70).

Subsequent to Cabrera's hybridization of alpacas and vicuñas was the recorded attempt of Faustino Belon, Puno, Perú (Madueño, 1912, p. 18). Belon obtained fertile hybrids which "degenerated" after the third generation to one or the other of the parent stocks.

The method of alpaca-vicuña hybridization is interesting. A young male vicuña is captured and given to a lactating female alpaca. The skin of a baby alpaca is used to disguise the vicuña during acquaintance. The vicuña, when 1 year old and sexually mature, is given a harem of female alpacas (Maccagno, 1932, pp. 55–56).

Aboriginal uses.—Wool, meat, religious ceremony, dung fuel, hide, and medicine. The alpaca is not used for transportation of cargo.

Wool and weaving.—The fine quality (luster, strength, and resistance to fading and dyes) and length of alpaca wool give it superior value. The *Inca* reserved its use for the higher classes and for the royal family, and with it developed their magnificent textile art, which is perhaps unequaled for fineness and design by that of any other aboriginal group in the world. Even today, alpaca wool amounts to about half of the total wool production of Perú (including that of sheep), and about 65 percent of the total value (Tappy, 1944, p. 50); it forms about 95 percent of the lamoid wool exports. There are now five grades of wool besides the "alpaca primeira" and "alpaca suri"; only 3 to 4 percent of all wool needs rejection, and the fleece is much cleaner than sheep's wool (ibid., p. 49).

Each alpaca is sheared every 2 years, beginning when it is 2 years of age. Growth amounts in 2 years to about 30 cm. (12 in.) in the common breed and 60 cm. (24 in.) in the suri; the maximum yield is obtained at 5 years of age. Shearing is done, generally, with broken glass or a knife, rarely with clippers (Maccagno, 1932), in the rainy season (January to March), when the day temperature is high and sheared animals do not chill, and rain can wash the unclipped wool on the backs of the animals. Aboriginal shearing must have required special implements, perhaps obsidian knives.

Meat.—Alpaca meat is eaten, especially in the form of dried "charqui," or "cecina"; about 18 kg. (40 lbs.) is obtained from a male, and 9.5 kg. (21 lbs.) from a female (Maccagno, 1932, p. 41).

Dung fuel.—Alpaca dung is extensively utilized as fuel (the entire range of the alpaca is treeless). The bolus is like that of the llama and is similarly deposited in communal spots.

Hides.—The uses of hides are similar to those of llama hides.

Husbandry.—Alpaca husbandry today is more complex generally than that of the llama. Herds are segregated according to age, sex, and use: Young, 3 to 8 months, both sexes; "extrema" males, 8 to 18 months; "extrema" females; "ancuta" males, 18 to 24 months; "ancuta" females; females with young to 3 or 4 months; pregnant females; sterile and old females; reproductive males; and castrated males ("capones," for wool and meat only). The best breeding males are 3 to 7 years old; generally 50 percent of the males are used for breeding; others are castrated. Old females, over 7 years, are often kept with the capones which are destined to supply meat for annual June "Beneficios." Breeding is aided often by man (through manipulation, as with stallions). (See Maccagno, 1932, pp. 34–36.)

Religious ceremony.—The alpaca had religious significance almost equal to that of the llama, and many were sacrificed to the Sun Gods.

> The black ones were reserved for Viracocha, the son of the Sun, and the white were reserved for the Sun God himself. The *Collas* tribe (*Aymara*, of Lake Titicaca), before their conquest by Lloque Yopanque, third *Inca* [Emperor] of Perú, about A. D. 1171, worshiped the white alpaca as their principal presiding deity and offered up sacrifices to him. They believed that their divinity had come among them in this form and, as a mark of favor to them, procreated more abundantly in their territory than elsewhere. [Tappy, 1944, p. 47.]

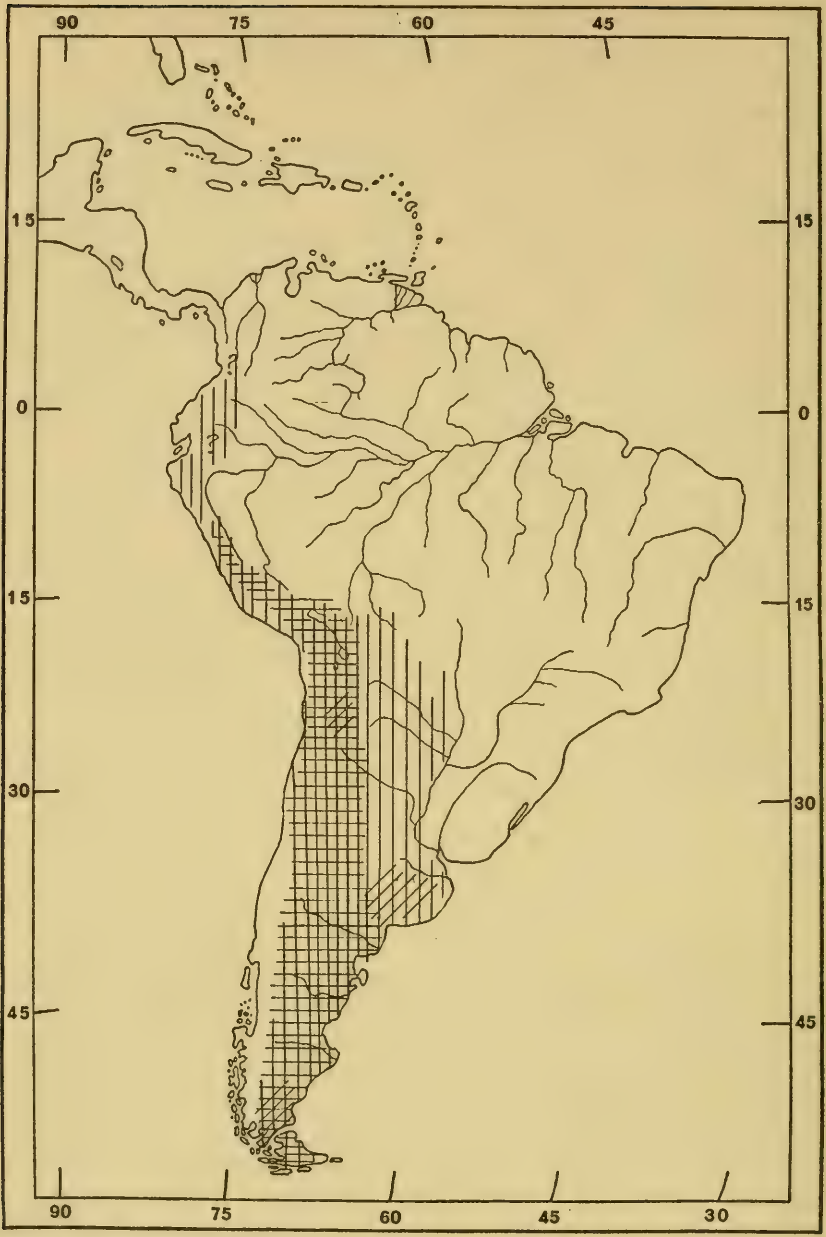
Medicine.—Bezoar stones were utilized, especially in Colonial times.

Pets.—Baby alpacas are kept often as pets by children, perhaps more so than llamas.

Lama glama guanicoe, or L. guanicoe: Guanaco

Distribution.—The present range of the guanaco extends from Central Perú south through the Andes and coastal ranges of southern Perú and North Chile (where it reaches the Coast) to mid-Chile, thence east and south through the Eastern Andes and Argentine Pampas, from a rough line between Mendoza and Bahia Blanca, to the Patagonian steppes, Tierra del Fuego, and across the waters of Beagle Canal to Navarin Island (map 14). Formerly, in prehistoric, early Recent, and late Pleistocene times, the guanaco ranged also far northeast over parts of Paraguay and extreme northern Argentina, and perhaps as far northwest as southern Colombia, where a Paramo de Guanaco exists. The alleged llama bones from early archeological sites in Ecuador may be those of guanaco. Cieza de León (Markham's ed., 1864, p. 207) recorded it in early Colonial times from Loja, southern Ecuador.

Description (pl. 44).—*Size:* Similar to llama, but slimmer; total length around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MAP 14.—Distribution of the guanaco. (*Horizontal hachure*, present range; *vertical hachure*, prehistoric; *diagonal*, Pleistocene.)

2 m.; height 90 to 110 cm. (35 to 43 in.); weight about 75 to 100 kg. (165 to 220 lbs). *Color:* Rich tawny brown or faded brown dorsally and laterally; white ventrally and medially (including neck); smoky gray brown on head, with whitish orbital rings, chin, lips, and ear edges; albinism occurring, melanism absent. *Pelage:* Soft, silky, wool underhair, 30 to 40 mm. (0.90 to 1.20 in.), over body, neck, and chest, with varying amount of long but fine overhair (beard or guard hair), 60 to 90 mm. (1.2 to 2.7 in.), which often is ridgelike along back of neck; chest and upper belly with longer white hairs, 100 to 120 mm.; short hairs on lower legs and head; almost bare on axillae and groin. Winter specimens from Patagonia and Navarin Island have a profusion of long, rich brown overhairs (to 150 mm., or 4½ in.) on body and neck, which almost obscure the woolly underhair. Probably a complete annual molt is experienced in summer. The juvenile pelage of "chulengos" up to 4 to 5 months is composed of soft, silky wool hairs without dimorphism, and is highly prized. *Tail:* Short, about 25 cm., heavily haired with wool and hair, and carried out and down in an arc, like llama. *Feet:* Large, and like llama. *Metatarsal glands:* Pair on each hind shank; clearly visible, ovoid, and large. No medial callosites on "knees" (wrists) or sternum. *Ears:* About 15 cm.; rimmed with short white hairs; gently scalloped terminally on anterior edge. *Skull:* Large; rostrum long (premaxillae to antorbital border greater by 10 to 15 mm. than antorbital border to posterior face of condyle); choanae narrow or open V-shaped, rarely U-shaped; facial pits large; molar teeth large; P 3–4/4 large; heel and endostyle of M/3 usually large; mandibular symphysis long (about twice width); lower incisors imbricate, rooted, spatulate, with enamel labially and lingually; submental foramina just anterior to menton; condyle relatively high above angular process of mandible. The skulls of guanacos are very difficult to distinguish from those of the llama; in the guanaco the mandibular condyle is often higher above the angular process, and the endostyle of M/3 more often larger; the frontals may be slightly less depressed also. A combination of skin and skull, however, usually can be identified as of one or the other species, and the two are always distinguished by natives. However, overlap occurs frequently enough to justify considering the two as conspecific. *Reproduction:* Rut in summer; gestation 11 months; one or rarely two young, very precocious, weaning in 4 to 6 months, and maturing in several years; longevity perhaps 30 years or so in wild state (Simpson, 1934, p. 191). *Hybridization:* Fertile crossing possible with llama, alpaca, and vicuña, though such hybrids doubtful in nature, especially those of guanaco-vicuña, and these probably not always fertile. *Intelligence:* Low. *Disposition:* Curious, calm, and easily tameable when young, though adults probably less manageable, and captive males in rut dangerous. *Habits:* Herbivorous, gregarious, polygamous with male dominance and dependence of others on his leadership; found in arid, treeless country and deserts from 17,000 to 18,000 feet (5,200 to 5,600 m.) down to sea level, and in the forests of Navarin Island, and the southern Chaco (formerly). The natural social organization consists of herds of 4 to 10 females and young with a male leader, herds of bachelors up to 3 years or so, and often solitary males; sometimes there are large composite herds of hundreds of individuals after calving season and before rutting. The male leader is also the sentinel; when he is shot the females are as likely to remain as to flee, but on the death by shooting of a female all immediately escape in a group. Severe fighting with teeth and hoofs takes place between males in rutting season for conquest or retention of harems. Deposition of dung is made in communal places which are conspicuous sights in guanaco country; also, common wallowing and trampling grounds are used, perhaps to take advantage of a dusty spot to remove parasites; common dying places, however, are now discredited. Bezoar stones (gastric calculi) common

and once highly prized for medicinal purposes. *Voice:* A distinctive tremulous neigh or querulous bray; a "yammer" (Simpson, G. G., 1934, p. 192).

Remarks.—The guanaco is the most widely ranging and most adaptive of the four lamoid forms. It successfully meets environmental conditions from sea level to 17,000 feet (5,200 m.) altitude, and from barren hardpan deserts to forests, but all these have some degree of aridity. It is a good swimmer.

Ethnozoology of the guanaco.—The guanaco is a wild form slightly distinct from the llama and probably the progenitor. Many Pleistocene and early Recent fossils have been identified as belonging to the guanaco. For countless centuries, young individuals have been tamed by aborigines for pets, perhaps to be killed later for food and perhaps consciously tamed for this purpose. The conclusions are that the guanaco may represent the wild representatives and ancestral stock of the domesticated llama. Today there are a few semidomesticated herds in Argentina, but they are somewhat refractory to domestication and it is doubtful that the present members ever will be fully domesticated so that they can be raised easily in semiconfinement and utilized as is the llama, which already serves the purpose. Hybridization with the llama confuses this situation.

Though man utilized the guanaco over its entire range, the dry Pampas of Argentina and Patagonia were the areas of greatest numbers of individuals and of the most complete cultural utilization. The guanaco was the most conspicuous and one of the most typical animals of these plains, as was the bison on the Great Plains of North America. With the rhea, perdiz, fox, mara, viscacha, cavy, tuco-tuco, and armadillo, the guanaco constituted part of a plains fauna that was relatively completely and easily utilized by man.

Today the guanaco has been extirpated over much of its northern and southern Argentine range, and elsewhere it is much reduced in numbers.

To the *Tehuelche*, *Puelche*, northeastern *Araucanians*, *Huarpe*, and *Querandí*, the guanaco supplied meat for food; fur and hide for clothes and shelter; bezoar stones for medicine; sinew for sewing; pets for pleasure (and food ?); a stimulus for myths and many verbalizations to account for age, sex, color, etc.; and an object of time-consuming hunting activity for the men and accessory duties for the women. Like the bison-hunting Indians of North America, the guanaco-hunting Pampa Indians were savage fighters, easily shifting their hunting techniques to warfare and fiercely resisting the inroads of the Whites.

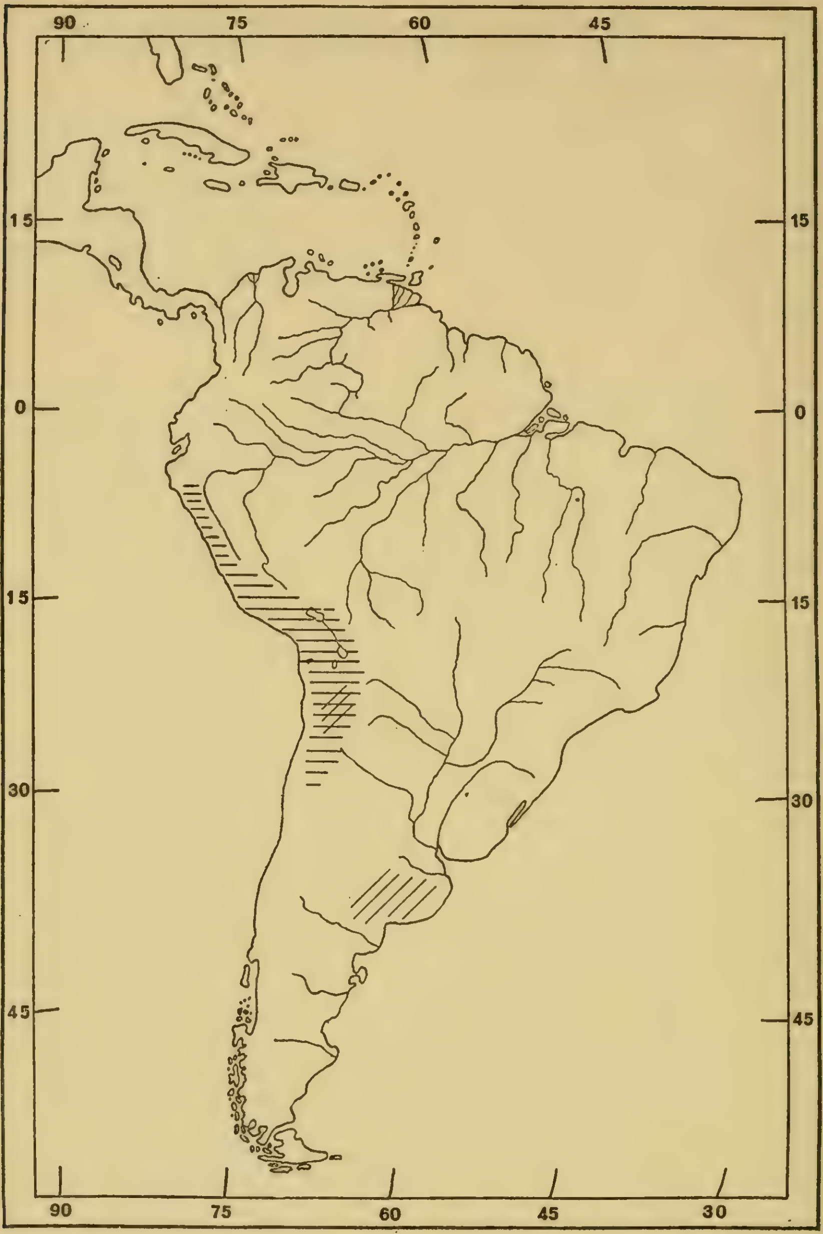
The *Inca* obtained many guanacos in their periodic hunting drives for vicuña. (See p. 454.) The older females and many of the males were killed for meat, wool, and hide; the younger females were sheared and released. The meat was given to the common people, as was the wool, which was considered coarse and of poor quality (probably because of the quantity of guard hairs).

The aborigines hunted guanacos by drives and ambuscades with bow and arrow, spear, and bolas, sometimes with the aid of dogs. Later, when the European horse was acquired from the Spaniards, the encircling "rodeo" with bolas prevailed. Finally, with the advent of firearms and the disappearance of the Indian, the hunting degenerated to a slaughter of the newborn to 3- or 4-months-old chulengos by White hunters for the skin only.

Lama vicugna or Vicugna vicugna: Vicuña

Distribution.—At present the vicuña is distributed from North or Central Perú south through the High Andes and coast range mountains through Bolivia to adjacent North Chile and Argentina (map 15). In the late Pleistocene and early Recent, it ranged as far east as the Humid Pampas of Buenos Aires (Lopez Aranguren, 1930; Cabrera 1931). Cieza de León (Markham's ed., 1864, p. 207) recorded the vicuña from Loja, southern Ecuador, in the 16th century.

Description (pl. 44).—*Size:* Smaller and more slender than the guanaco, though neck equally as long (or longer ?); total length, around 175 cm. (70 in.); height at shoulder, 70 to 90 cm. (28 to 35 in.); weight, approximately 35 to 60 kg. (77 to 132 lbs.). *Color:* Rich "vicuña" brown dorsally and laterally and on entire neck and head; white ventrally and medially and on chin and under eyes and on flanks, showing conspicuously on brisket, underside, and especially tip of tail; otherwise very uniform brown all over; small circle of black stiff hairs around eyes. *Pelage:* In summer, short and curly wool underhair on body and neck (30 to 40 mm., or 1.9 to 1.5 in.), with rare scattered guard hairs almost concealed in the wool; short but thick hair on legs and face, gradually shortening in length from body hair (this change in hair length is abrupt in llama and alpaca); almost bare on axillae and groin; long hair-fringe on brisket (100 to probably 300 mm., or 4 to 12 in.) on both males and females (perhaps longer in some males and certainly longer on both sexes in winter) and linked between bare axillae to chest and belly patch of long hairs (100 mm., or 4 in.). Single annual molt of entire pelage in summer. Wool hairs very fine, silky, though short. (See below.) *Tail:* 25 to 27 cm.; woolly hair, brown dorsally and laterally with white ventrally and terminally (conspicuous white tip). *Feet:* Small; fore and hind subequal; ridge on nails not pronounced. *Metatarsal glands:* Present on hind shanks, though completely concealed by heavy, short hairs; more lanceolate-shaped than oval, and smallish. *Ears:* Shortish (13 cm.), and lanceolate (without scallop). *Skull:* Very distinct in rootless, parallel-sided, ever-growing lower incisors with enamel on labial side only—characters which tend to support subgeneric (or generic rank)—otherwise, skull small; facial portion (from premaxillae to antorbital border) always slightly shorter than cranial portion (antorbital border to rear of occipital condyle); facial pits absent or very small; teeth small, especially P 3–4/4 and posterior lobe of M/3; choanae open and U-shaped; palate very narrow at diastema; vomer ending in a long posterior spine; incisive foramina not extending anterior of alveolus of I 3/; manibular symphysis short and broad with submental foramina slightly posterior to menton. *Reproduction:* Rut in late summer, gestation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Map 15.—Distribution of the vicuña. (*Horizontal hachure*, present range; *diagonal hachure*, Pleistocene.)

10 months, mature in a year (Cabrera and Yepes, 1940, p. 268). *Hybridization:* Possible with guanaco, llama, or alpaca, but rarely (or never ?) in the wild with any of these, and in captivity with alpaca only, to any extent; hybrids probably not always fertile, and if so, always reverting to parent stock with continued interbreeding. *Intelligence:* Low. *Disposition:* Curious, calm, and docile, affectionate and playful, especially when young; but generally reverting to wildness later in life; rutting males are vicious. *Habits.* Social in small herds; gregarious, herbivorous, polygamous with male dominance, and when male leader is killed the harem females remain; said to prefer marshy or other soft ground (like alpaca), but often seen in dry barren places. *Diseases:* Probably mange in captivity, but in wild state conditions not known. *Voice:* Peculiar neigh ("chillido ou relincho peculiar"; Ridoutt, 1942); perhaps more of a whistle than a neigh, because it can be distinguished from the cry of any other animal (Tschudi, 1844–46, p. 218). *Special physiology:* Like llama (p. 436); red blood cells 14.9 million per cu. mm. (Dill, 1938, p. 131). *Remarks:* The vicuña is a species restricted to the arid high altiplano, or hard pampas of the adjacent Coastal mountains.

Ethnozoology of the vicuña.—The vicuña is a good example of an animal that has been subjected unsuccessfully to many and carefully premeditated attempts at domestication, in this case because of the high value of the wool. Attempts of the *Inca* and their predecessors to domesticate the vicuña are not known, though it may be assumed that they also tried and were unsuccessful and that they then adopted the method of periodic round-ups (drives) and capture of wild stock for shearing. A notable attempt at domestication was made by the priest Cabrera in southern Perú in 1821–42, who consciously or unconsciously aimed eventually at alpaca-vicuña hybridization; but neither his domesticated vicuña nor paco-vicuña hybrids became established. Other recorded attempts have failed also. (See p. 445.) Today several "criaderos" exist in Perú and Bolivia, but they have amounted to little more than semiconfined protection for the vicuñas. Simón Bolivar, in 1825 in Perú, issued a governmental decree offering a monetary reward for domestication based on "experience [which] shows every day the facility with which they are domesticated" (Maccagno, 1932, p. 58)!

The vicuña is prized for its silky, fine, richly colored wool. The *Inca* reserved the wool for the royal family and a few honored high officials. The value of vicuña wool lies in its fineness (0.00043 in. in diameter and 2,500 fibers to the inch; sheep, 0.0008 in.), soft and silky texture without predominating medulla, good surface cohesion of overlapping cortical scales, tendency to curl, elasticity, fine and uniform pigmentation, beautiful rich natural color, resistance to dyes and fading, and luster (Stroock, 1937 b). About 500 gm. can be obtained from a single animal (Maccagno, 1932, p. 28); but 250 gm. seems to be the average individual yield; and of this, half is made up of worthless stiff guard hairs (Stroock, 1937 b).

The *Inca* practiced true conservation of the vicuña; they prohibited indiscriminate hunting, and harvested a crop of wool, meat, and hides periodically from the wild herds, allowing sufficient stock to remain for breeding and increase. The periodic vicuña hunts were called "chacus," and were held every 3 to 5 years in certain provinces, some of which were divided into special sections pertinent to this purpose. On royal order, 20,000 to 30,000 Indians were assembled to build an immense corral 2 to 3 km. in diameter, with the entrance on one side about 120 m. wide, and posts of a man's height connected with ropes for enclosing the animals and entangling them in attempted escape. Colored rags were hung from the ropes, and these fluttered in the wind and frightened the vicuñas from trying to escape. Bolas were also placed at certain intervals along the fence. Then the Indians formed a semicircle and "beat" an area sometimes as much as 20 to 30 km. in diameter. All the thousands of vicuña, guanacos, and deer, and many other animals, such as bears, pumas, and foxes were driven into the corral. The bears, pumas, and foxes were killed as predatory vermin; but some were saved for pets or "torture animals." The deer, guanaco, and vicuña were caught by hand or with bolas. All the guanacos and vicuñas were shorn of wool; the young and reproducing females, together with enough young males for breeding purposes, were released; the old females and other males were killed for their meat and hides. Deer were treated similarly except that they were not shorn. The wool of the vicuña went to the Virgins of the Sun for weaving into garments for royal use; the guanaco wool went to the Indians, as did the meat of all and was dried into "charqui" for preservation. Counts of all species and their destiny were kept on quipus (knotted counting strings). Garcilaso de la Vega (Markham's ed., 1869, 2: 115–119) gave a detailed account of this "chacu," and stated that the hunts were held every 3 years, because this interval was sufficient to reestablish normal numbers of game (20,000 to 40,000 head per chacu) without allowing them to become a nuisance, and also to allow the wool of the shorn vicuñas to reach a maximum length; he did not mention the corral. (See also Cabrera and Yepes, 1940, p. 268.) Bezoar stones from the ruminants were a byproduct of the chacu and were greatly prized for medicinal purposes.

THE DOMESTICATED CAVY, "GUINEA PIG" (CAVIA PORCELLUS)

Cavies (sensu stricto), small, tailless, hystricomorph rodents of Neotropica, constitute the supergeneric group *Cavia*, or subfamily Caviinae, of the family Caviidae. The name "cavy" is often applied also to the related but much larger Patagonian hare, or mara (*Dolichotis*).

Classification

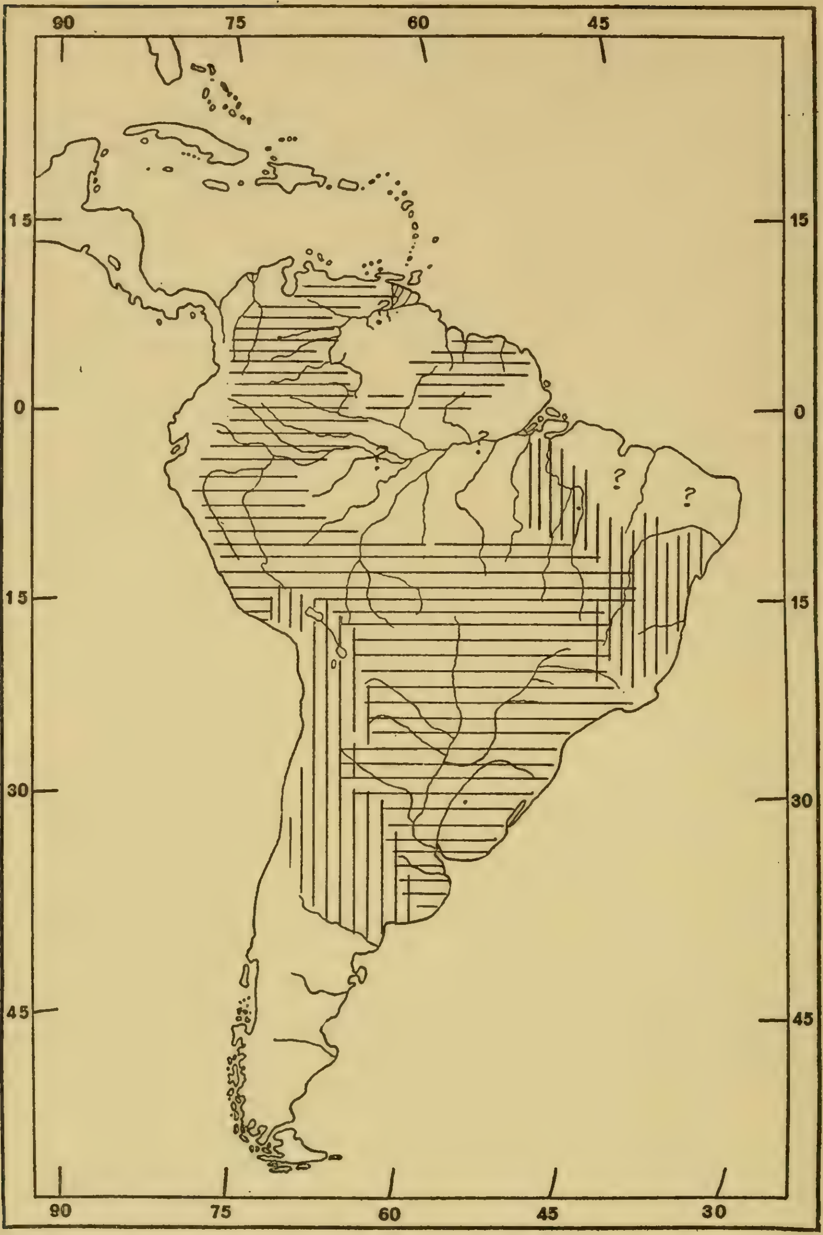
Supergeneric group *Cavia*, or subfamily Caviinae. Cavies (sensu stricto).
  - Genus *Kerodon*. "Mocu"; northeastern Brazil.
  - Genus *Microcavia*. "Cui" (syn. *Caviella;* includes *Nanocavia* and *Monticavia*); Patagonia-Chilea cavies.
  - Genus *Galea*. "Cui," "pampahuanca"; Highlands of Bolivia to Pampas of Argentina; also northeastern Brazil (an isolated species).
  - Genus *Cavia*. "Cui," "preá," "cori" (*C. aperea*, *C. "tschudii,"* etc.); Guiana-Brazilia; includes the domesticated cavy (*Cavia porcellus*).

We are concerned here primarily with *Cavia*; secondarily with *Galea*. The above classification of the cavies is modified slightly from that of Kraglievich (1930 a), who kept *Monticavia* separate from *Microcavia*, but included *Nanocavia* in *Microcavia* "because they are so much alike." As the generic character of *Microcavia* rests primarily on the postnatal replacement of DP 4/4, and as a specimen of "*Monticavia*" *niata* (USNM–172942, from Mount Sajama, Bolivia) also shows postnatal development of DP 4/4, these three groups are included in the same genus. *Caviella* (Osgood, 1915) is a synonym of *Microcavia* (sensu lato). All cavids except *Microcavia* have prenatal replacement of DP 4/4 by P 4/4. (See also Osgood, 1915; Thomas, O., 1917; and Ellerman, 1940–41, 1: 240–247.) All of many specimens examined of wild *Cavia* appear to be conspecific, *C. aperea*.

Cavia porcellus (syn. C. cobaya): Domesticated cavy

Distribution.—In late pre-Columbian times the domesticated cavy was found throughout the Andes from Central Chile north to Central America (?) and probably to the Antilles, where they were recorded by the Spaniards shortly after the Discovery (map 16).

Description.—*Size:* Total length, about 300 mm. (12 inches); tail absent externally (but present under the skin and about 25 mm.); weight, 750 to 1,250 gm. (2 to 3 pounds). *Color:* Monochrome and polychrome; generally white, brown, or black, or of mixtures or intermediate shades; original color probably "agouti" (gray-brown-black grizzled or "ticked"). *Pelage:* Short and silky generally; long, fine, and curly in one breed (Angora). *Ears:* Short, closely appressed to head and slightly "scalloped" posteriorly in typical hystricoid form. *Legs:* Short. *Feet:* Fore, short with 4 toes; hind, long with 3 toes. *Skull and skeleton:* Relatively large, heavy, and rugose; large antorbital foramen (as in all hystricomorphs); lacrymal not broadly interrupting zygomatic extension of maxillary (also other *Cavia*); incisor teeth unpigmented (all *Cavia* and *Microcavia*); rostrum relatively broad and flat; post-palatal margin smooth (rarely with spine as in other *Cavia*); naso-frontal suture truncate (rather than W-shaped); fronto-parietal suture convex posteriorly (rather than straight); para-occipital process relatively short and blunt; auditory bullae small with relatively long anterior projection and meatus; pterygoids smallish; no transparent areas in frontal region (Ubisch and Mello, 1940, p. 397); coronoid-condylar distance on mandible short, and angular process short; inferior surface of atlas vertebra singly perforated (like *Kerodon*; doubly perforated in *Galea* and *Microcavia*); neural spine of axis vertebra large and massive; and acromion of scapula wide.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Map 16.—Distribution of wild *Cavia* (*horizontal hachure*) and *Galea* (*vertical hachure*).

(For illustrations of some of these characters, see Detlefsen, 1914, pls.) *Reproduction:* Breeds continually throughout the year, generally 4 times; gestation 60 to 65 days; young at birth 2, 3, or 4 (rarely 1, 5, or 6). *Mammae:* 2 (1 pair) inguinal. *Growth:* Wean at 2 months; mature sexually in 2 to 3 months. *Longevity:* 5 to 8 years? *Intelligence:* Low. *Hybridization with wild forms:* (1) With *Cavia "aperea"* (=*C. aperea pamparum*?) of northern or Northwest Argentina, produced fertile offspring, both inter se and in backcross (Nehring, 1894); (2) With *Cavia "rufescens"* (=*C. aperea fulgida*?) of Campinas, São Paulo, southeastern Brazil, yielded fertile female hybrids, but male hybrids sterile down to and including many of the ⅛ wild hybrids (Detlefsen, 1914; Ubisch and Mello, 1940); (3) With *Cavia "cutleri"* (=*C. aperea pallidior*?) from Arequipa, southern Perú, produced fully fertile hybrids of both sexes, either inter se or in backcross (Castle, 1916); and (4) with "wild Brazilian ancestor," no interbreeding (Haeckel, quoted by Cumberland, 1886[?], p. 27). *Habits:* Sedentary; gregarious without social organization aside from usual male dominance over several (up to a dozen) females, accompanied by bitter fights between males; herbivorous and frugivorous; poor burrower. *Diseases:* None aboriginally (?); but with the advent of bubonic plague around 1900, the cavy has proved highly susceptible, and recently thousands have been destroyed systematically in Ecuador and Perú by public health officials amid scenes of grief, and antagonism from the Indian owners.

Economic value.—Primarily for meat; secondarily as agent in medical mysticism, in religious ceremony, and also as pets (recently as a laboratory animal).

Remarks.—The cavy, or "cui" (the names "guinea pig" and "cobaya" are patent absurdities), the llama, and alpaca are the only South American mammals that have been domesticated. Cavies were encountered along the Andes from Ecuador (and Columbia ?) to Central Chile by the early Spaniards, among the *Arawak* of Hispaniola and Cuba by Columbus (?), and in Yucatán by Cortes (?).

Today cavies may be seen around most Indian dwellings throughout this area, and from 5 to 15 usually may be encountered in a house, where they remain voluntarily and scurry around the furniture and dark corners, squeaking plaintively when disturbed (hence the name "cui," "kwee"). The native seems greatly attached to his cuis, but the animal apparently does not occupy a very important place in his economy save as an occasional source of meat prepared with hot spices, and occasionally as an adjunct in medical diagnosis through magical means and in medical treatment (the warm viscera and quivering body of a freshly killed cavy are laid over the abdomen of a patient who is suffering intestinal pain). The cavies receive little care and have no special cages; their only food is table scraps and some greens and fruit.

The *Inca* are said to have sacrificed 1,000 cavies to Frost, Air, Water, and Sun in ceremonies during the month of August (Rowe, Handbook, vol. 2, p. 310).

The homeland of the domesticated cavy was thought at first to be Brazil, probably because of the accurate description of the animal in

Marcgrave's report (1648) of the animals of the Pernambuco region; and the stem form was considered to be the Brazilian *C. aperea* by the French authors. (See Cumberland, 1886 [?], pp. 26–27.) Rengger (1830, pp. 274–278) postulated Paraguay as the homeland, with the local population of *C. aperea* as the stem form, and this statement persisted for many years. Darwin (1876, 2:135, footnote) noted that the wild *aperea* of La Plata had a louse of a genus different from that infesting the domesticated cavy, and concluded that the latter had not been derived from the former, and that any alleged inability to interbreed was not a result of domestication. Nehring, in a series of papers (1888, 1889, 1891, 1893, and 1894), claimed that the homeland of *C. porcellus* was Perú, and that the stem form was *C. cutleri* Bennett (1835). However, O. Thomas (1917, p. 156) showed that Bennett's *C. cutleri* was without exact locality on the coast of Perú, and that it was a melanistic individual which was identical with *C. porcellus* in morphology.

Tschudi (1844–46, p. 195) wrote about a large agouti-colored cavy from Ica, southwestern Perú, under the name of *C. cuttleri* (sic), and Fitzinger (1867) redescribed this form as *C. tschudii.* Castle (1916) obtained three individuals of a similar large wild cavy from Ica, interbred them freely with laboratory *C. porcellus*, and said that they were probably feral *C. porcellus*. However, the bare possibility exists that this Ica "*Cavia cuttleri-tschudii-porcellus*" may be a true wild cavy, and that it represents the wild stock of the domesticated form. Castle (1916, pp. 5–6) found seven mendelizing unit-character variations among the cavies in the Indian houses around Arequipa, as follows: Agouti, black, yellow, albino, red, smooth, and rosette. Aside from agouti-colored individuals, all were spotted; he found no self-colored ones.

The Division of Mammals, United States National Museum, Washington, D. C., recently received four cavy skulls from pre-Columbian archeological sites in Perú (three from Ancón, one from Pachacamac near Lima), and some specimens of wild cavies from Arequipa and from near Ica, South Coastal Perú. The four archeological specimens are presumed to be of domesticated stock because the three Ancón skulls had quantities of adhering white and/or pure brown hairs.

These specimens show some intergradation in the morphologic characters which usually separate wild *Cavia* from the domesticated stock. The frontoparietal suture of three of five wild skulls and of three of four archeological skulls is convex posteriorly (the domesticated character); in the others it is almost straight. The nasofrontal suture of all is flat M-shaped (the wild character; in the domesticated condition it is almost straight). A palatal spine (wild character) is present in two skulls of the wild specimens (absent in two; one skull broken and not observable); this spine is present on one of the archeological skulls. The broad rostrum of the domesticated stock seems to be a heterogonic character of old age. The tail vertebrae number six in all four skeletons of domesticated stock in which the tail is present (with four sacral vertebrae), six in all three wild Coastal Peruvian skeletons available (also with four sacral vertebrae); eight tail vertebrae existed in two specimens of wild Brazilian stock examined in the field (Anapolis, Goias), counted without regard to sacral number.

It is highly probable that the domesticated cavy can be linked to wild South American stock through archeological specimens from Perú, and through the Peruvian Coastal wild populations. It is apparent that a profitable study could be made of the morphologic changes concomitant upon domestication. Domestication here seems to have been made from certain populations of a widely ranging wild species, and to have resulted in increased size, selection of genetic color strains, heterogonic skull differences, and genetic loss of wildness (wild *Cavia: C. aperea* from Brazil and Colombia were incorrigibly wild and refractory to captivity). Unfortunately, to date there is lack of knowledge of morphology of skull and skeletal characters of all the several homogeneous domesticated strains of cavy. Some characters which are attributed to the entire domesticated stock may be characters only of a single or of several strains. Genetics may be the science to elucidate the taxonomy and other problems of this domestication.

The conflicting results in producing fertile offspring when crossing *porcellus* with wild populations may be a consequence of the actual specific difference of some of the wild stocks in question, though here all are considered on morphologic evidence to be provisionally conspecific (*C. aperea*). The various results may be caused by marked physiological differentiation in geographic races. Cases are known where subspecies on the opposite ends of an intergrading "Rassenkreis" are morphologically and physiologically as distinct as two species.

The Central Andean region represents the locus of the highest populations of the domesticated cavy, and this condition probably has existed for several millenia. However, remains of domesticated cavies are very scarce in Peruvian archeology. Of many hundreds of pictorial pots seen in the museums of Chiclín and Lima, none unmistakably portrayed cavies; and only two undoubted mummies of *C. porcellus* (from Nazca) and one pot of doubtful cavy form (origin unknown) were seen. (See also Schmidt, M., 1929 b, pls. on pp. 216, 561.) None was at the Museo Chiclín in northern Perú. On the other hand, remains of llamas are multitudinous, and many other animals are represented on pottery drawings or in the shape of the pots themselves. (See p. 357.) Hence, the rarity of the domesticated cavy in Peruvian archeology is a mystery and a paradox, and may be considered weighty evidence against the theory that the cavy was domesticated in the Peruvian area. However, the morphologic and genetic evidence points to the Andean Highland area, or its immediate environs, as the home of the domesticated cavy. Negative evidence for other areas supports this thesis.

Today the genus *Cavia* is found wild in the Highland area as far south as Cuzco and La Raya Pass (separating the basins of Cuzco and Puno). From Puno southward, the wild cavy is another genus, *Galea*, which is small, grayish, with four mammae, and is easily captured and kept alive in captivity (generally difficult for wild *Cavia*). To any observer in this Highland region, it appears strange that *Galea* has not been domesticated either prior to and instead of *Cavia porcellus*, or subsequently, upon stimulation of such a cultural trait involving a closely related animal.

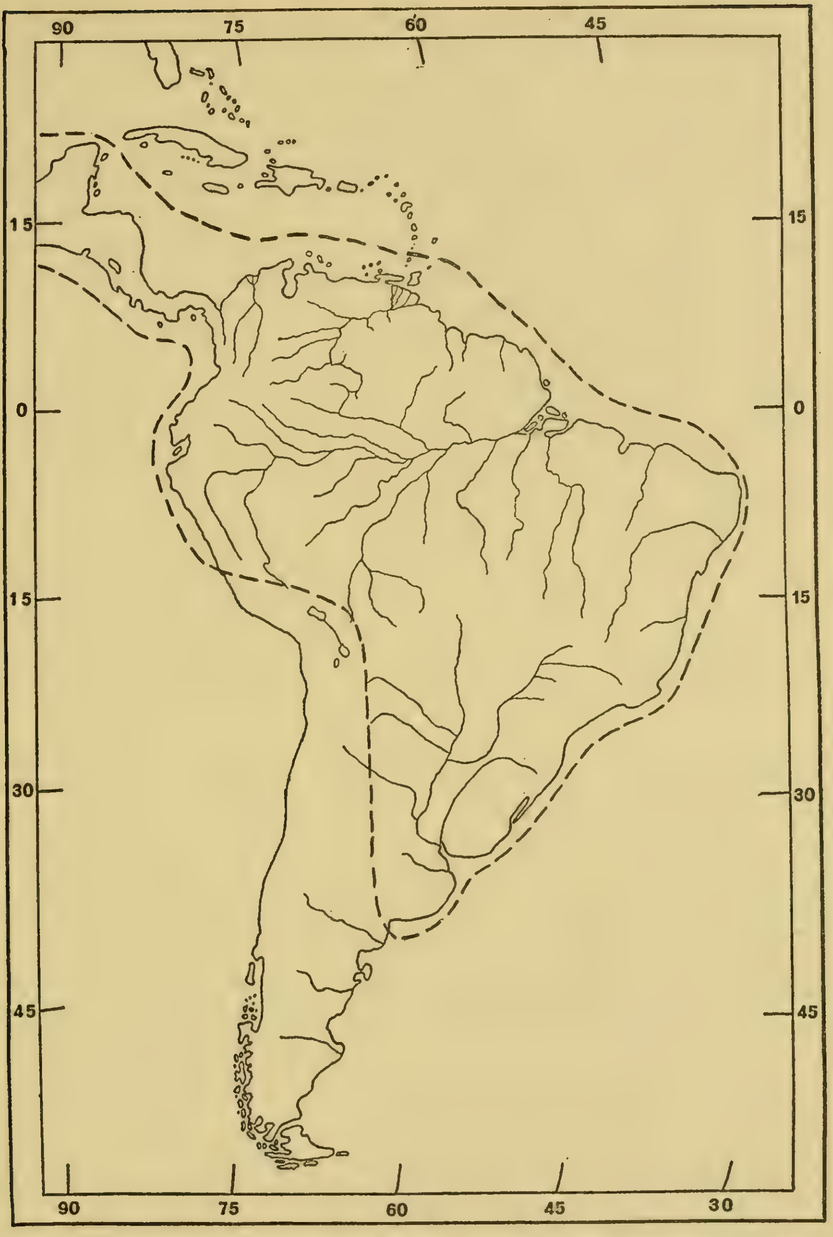
THE MUSCOVY DUCK (CAIRINA MOSCHATA)

This duck is the only domesticated bird from South America and it is found both wild and domesticated (the turkey is a southern Mexican domesticate).

Distribution.—In the wild state the Muscovy duck ranges over Guiana-Brazilia and Central America (map 17). As a domesticated bird, it occurs over most of Neotropica, including the Antilles, where it was present when Columbus landed, though it does not occur wild on the islands. It is very numerous in Perú and Paraguay.

Description (pl. 45).—*Size:* Large; total length (tip bill to tip tail feathers), males 70 to 80 cm. (28 to 32 in.); weight, 4 to 5 kg. (8 to 10 lbs.); females about half this size. *Color:* Males and females alike (except for caruncles on bill in males); wild populations dark brown or blackish all over, except for striking white upper and lower wing-coverts and axillars, and pinkish caruncles in males; greenish sheen on shoulders and on wings; domesticated individuals, as given above, or with various amounts of white, to almost pure white. *Caruncles:* Warty excrescences between bill and eye, present and pinkish on males, absent on females. *Habitat:* In the wild, along jungle streams; apparently not common on savannas. *Habits:* In wild state, generally solitary; sometimes flocking on large bodies of water in dry winter season; in domestication, solitary or in small family groups; shy, almost voiceless. *Reproduction:* In wild state, nests in trees; in domestication, anywhere; polygamous, with much fighting between males in breeding season. *Musk:* None. *Hybridization:* In domesticated state, breeds with any other duck, but hybrids are sterile; probably wild and domesticated populations interbreed at any opportunity. Sterility of hybrid Muscovies has been questioned.

Remarks.—The domesticated Muscovy duck seems to be conspecific with its wild populations; variation in morphology and color overlap.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Map 17.—Distribution of the wild Muscovy duck. (After Phillips, 1922, vol. 1, map 2.)

It was introduced into Europe in the middle 16th century, and soon afterward spread over Africa and Oceania, but it was never popular in Europe or North America. It became feral in parts of Europe and southeastern Asia, and Pallas in 1831 and Keyserling and Blasius in 1840 claimed that it was a native wild species. The name "Muscovy" probably comes from Pallas' account of the duck in his treatise on Russian (Muscovite) animals; or it may come from the erroneous claim of Buffon that the bird has a musk gland, or from the alleged derivation of the species from the Mosquito coast of Central America or from the *Muisca* Indians of Nicaragua. (See Phillips, 1922, 1: 57–67, from which the above account is taken.)

The Muscovy duck was and is used primarily, and generally exclusively, for meat. However, Ignacio de Armas (1888, p. 132, quoting Garcilaso de la Vega) noted that the pre-Columbian *Incas* dried the meat and produced an aromatic powder (presumably from the alleged natural musk of the animal). Pizarro is said to have received duck powder to perfume himself. Such uses are not easily explained as the bird is not considered to have musk.

The origin of domestication is not known, but evidence indicates that it was in the area of high cultures in the Central Andean region, probably Perú. Representations of the Muscovy duck are common on pre-Columbian pottery in Perú.

SUMMARY

South America, Central America, and the Antilles, make up the Neotropical zoogeographic region of the world. This region is noted for its rich fauna, composed of a great number of unique or endemic forms, and invaders (some now distinct) from North America since Pliocene times. The fauna is divisible into primary endemics of pre-Pliocene Neotropical origin (when South America was a continental island), secondary endemics from changed invader stock since Pliocene contact with North America, and unmodified invaders. Man is one of the latter, and long has been an important faunal element.

At present there are many diverse species, but the Pleistocene and early Recent saw the extinction of many others, particularly large forms. Man perhaps hastened the extinction of some. This late Tertiary extinction, for one reason or another, reduced the plains faunas particularly, though less so in the southern temperate parts of Neotropica than in the central and northern tropical parts.

Neotropica is divisible into four subregions: (1) Guiana-Brazilia, (2) Central America, (3) Antillea, and (4) Patagonia-Chilea. The first three constitute at least 75 percent of the whole region, and are tropical. The rich ethnozoology of these tropical subregions may be separated into Continental Tropical, and Antillea Tropical on the basis of the different faunas. Patagonia-Chilea is south temperate, and is characterized by the very large number of its primary endemic forms, which include the guanaco-llama-alpaca-vicuña-viscacha-mara-rhea-perdiz fauna of the plains and mountains. This fauna, with and without domestication, was thoroughly utilized in many special ways by man.

The domesticated llama probably was derived from similar wild guanacos. The alpaca probably was domesticated from a now extinct wild ancestor, Domestication of the llama and alpaca undoubtedly was accomplished somewhere in the contiguous altiplanos of Perú, Bolivia, Chile, or Argentina.

The other domesticated mammal of South America is the cavy (guinea pig); it probably was domesticated in the Central Andean region also, from the wild stock which exists there today.

The remaining domesticated animal, a bird, the Muscovy duck, has conspecific wild populations, and probably was domesticated, as were the others, in the Central Andean region.

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THE USE OF WILD PLANTS IN TROPICAL SOUTH AMERICA

By Claude Lévi-Strauss

INTRODUCTION

It is not always easy to distinguish between wild and cultivated plants in South America, and there are many intermediate stages between the utilization of plants in their wild state and their true cultivation. Karl von den Steinen (1894) gives several examples of these transitional stages in Central Brazil: among the tribes of the upper Xingú River (Handbook, vol. 3, p. 321), he saw paths lined with piqui trees, which generally grow wild, and with mangaba and urucú trees that had been transplanted near the settlements and artificially irrigated. On the other hand, actual cultivation was very rudimentary. One native tried to plant discarded matches; others blew on tobacco plants to insure their growing. The *Tupí-Cawahíb* of the upper Madeira River gather the seeds of an unidentified wild grass that grows in the forest, and in order to facilitate the harvest they tie together several stems before they are ripe, so that the seeds of several plants fall on the same spot and pile up in small heaps. The tribes of the Pimenta Bueno River leave on their clearings some palm trees, in the bark of which edible grubs develop. These are the first steps toward cultivation. W. E. Roth (1924, p. 214) writes:

> It must be borne in mind that in the clearing of the forest the Indian will usually save from destruction any economic palms or edible fruit trees. Dance says that kushi ants will not have their nests near a cunaparu (*Phyllanthus* sp.) plant, the milky juice of which is acrid and insufferably irritant, and it is for this reason that many fields contain two or three of these plants.

In the Tropical Forests, gathering as well as cultivation may be highly developed, for the utilization of wild plants often entails refined exploitative techniques that require far more than the mere collection of wild foods. Few people, for example, have made a staple of a food as highly poisonous as manioc. The great skill shown in utilizing the vegetable environment is also shown in the various uses made of the same plant. For example, manicoba (*Manihot dichotoma, M. glaziovii, M. heptaphylla, M. piauhyensis, M. violacea*) is a source of poison; of rubber (borracha do Ceará, de Jequié, de Manicoba); and of food, its grated roots being consumed as flour after the poison has been extracted and its oily seeds being eaten (Pio Corrêa, 1909). *Protium* *heptaphyllum* provides a balsam, a rosin for glazing pottery, and a drink, the last prepared from its fruits. The preparation of several wild foods requires various complicated processes, such as those for preparing bitter manioc and green-heart seeds (*Nectandra rodioei*). Roth (1924, p. 218) describes the latter:

> The seeds are grated and put in fresh water, and a matter precipitates similar in appearance to starch. It is repeatedly washed to lessen its bitterness, which is never lost entirely. It is then mixed with rotten wood, pounded previously and sifted, and those who have it in their power mix a little cassava flour with it.

In tropical South America, the general cultural levels are determined historically rather than by the local plant resources, for no fundamental culture traits appear to depend directly on the botanical environment. Pine nuts in southern Brazil and Brazil nuts in northern Brazil are two important foods not found elsewhere, yet no special aspect of the culture of the tribes exploiting them can be directly related to their exploitation; conversely, no special traits are found in the areas lacking these nuts. Fibers from palm trees (*Astrocaryum* sp.) and from a bromeliad (*Bromelia* sp.) are used indifferently in the same area, though palm fibers are more commonly used in the north and *Bromelia* in the south, and differences in materials and techniques between these two areas are insignificant. Nordenskiöld (1924 a) is responsible for the notion that wild plants "set their stamp on the culture of the Indians." The example which he gives is unconvincing. He writes:

> Thus, in 1909 I came across a couple of Guarayú Indians on the Rio Parapetí. They had long portable baskets woven out of paripinnate palm leaves. As we entered the Parapetí territory the baskets became worn out, but as there were no paripinnate palms in this part, they could not make new ones. If, for any reason, the Guarayú tribe were forced to migrate from their present region to the Parapetí region they would have to change the type of their portable baskets. [Nordenskiöld, 1919, p. 15.]

The statement draws its importance from a former statement by Nordenskiöld that "fanshaped leaves are of little use, while paripinnate are so useful" (ibid., p. 4). As a matter of fact, the Guiana Indians used both fan-shaped and paripinnate palm leaves, and both kinds have about equal value in basketry, so that the presence or absence of one or the other is of little consequence. The difficulty of the *Guarayú* mentioned was culturally, not environmentally, caused.

The facts, indeed, point in a quite different direction. Many vegetal species in South America have a widespread distribution, and the same vegetal environment surrounds tribes far distant from each other. For purely cultural reasons, these tribes make a very different use of their environment. The distribution of *Ficus*, *Bombax*, *Bertholletia*, and *Cariniana* does not explain the presence or absence of bark cloth; the two great centers of bark cloth, i. e., the upper Amazon and northeastern Bolivia, are cultural—not geographic—centers. The failure of Central Brazil to develop this industry was not because of the lack of convenient material; the *Bororo*, for example, make bark cloth, although only for the perineal band of women's dress.

The striking fact is that, far from depending wholly on the natural environment, South American Indians throughout the tropical area show exceptional ability to discover substitutes wherever a vegetal species is lacking. For example, Pardal quotes the substitution of the decoction of the bark of pariah (*Simaruba*, *Simaba*, *Picrasma*) for urucú (*Bixa orellana*) in the southern part of the tropical area where it is difficult to grow urucú. The principle of body ointment and adornment is preserved; the plant varieties used for this purpose differ. The same is true of the balsams: in the south, *Copaifera langsdorfii* replaces *Copaifera multijuga* of the Amazon; and when the Leguminosae listed in pharmacopoeia as yielding benzoin are lacking, they are replaced by either *Myrocarpus* or liquidambar (Pardal, 1937, pp. 104–105). For the varnishes, *Protium heptaphyllum* served in the north, *Bulnesia sarmienti* in the south; for stimulants, guaraná in the north, maté in the south; for weapons, arrow shafts are made either of taquara (*Chusquea* sp.) or of *Gynerium sagittatum*, according to the lack of one or the other in a definite region. The *Chané*, who lack even the latter, have replaced it with *Arundo donax* (Nordenskiöld, 1920).

It is also difficult to agree with another statement by Nordenskiöld (1919, p. 4), who says, "that the abundance of wild fruits, as well as the intensive dryness during part of the year and the flood during another part, account for agriculture being so underdeveloped in the Chaco." Nowhere in South America has the abundance of wild resources impeded agriculture. On the contrary, the various independent places of origin of agriculture postulated by Vavilov (1926, and after Sauer, 1937) all have many kinds of wild foods, and in South America incipient farming and developed exploitation of wild resources tend to be associated rather than mutually exclusive. That the abundance of wild foods does not preclude farming is shown in the case of Guiana:

> One Indian (Akawai) will clear and, with his wife, plant 2 or 3 acres in as many weeks, and 7 or 8 acres will supply them with a year's food, so that 10 or 12 weeks in the year is absolutely all that is required for actual labor, and the rest of the time remains for pleasure, hunting, and fishing. [Roth, W. E. 1924, p.214.]

In the mind of the South American Indian, the principal geographical distinction is that between the savanna and the forest. The first is unsuitable for cultivation as well as for gathering and collecting wild foods; both animal and vegetal life on it are sparse.

The forest offers abundant wild plants and game, and its moist soil is fertile. The stupidity of the deer which in a myth tries to cultivate manioc in the savanna filled the *Bacaïri* with mirth, according to Steinen (1894, p. 488).

Cooper (1942 a, 1942 b) has suggested that the tropical area of South America could be divided into two subareas according to the level of cultural achievement: ". . . the Orinoco-Amazonian farmers and the scattered tribes subsisting by a purely collecting economy or else with a rudimentary or recently acquired horticulture" (Cooper, 1942, b p. 147). The same author suggests that, considering the fairly close correlation between the cultural groups and the natural areas, the first group should be called Silval and the second Marginal, the latter subdivided into a Savannal and an Intrasilval subgroup. Irrespective of the usefulness of such a classification for practical purposes, it is necessary to keep in mind that farming always accompanies, and is never a substitute for, the exploitation of wild resources. The Silval area is not only an area of farming but is one with abundant wild vegetal food and industrial plants. Moreover, few tribes subsist solely by a collecting economy, and they are distributed at random in such varied places and in such geographic environments (the forests of Paraguay and the Guajira Peninsula, for instance) that their lack of farming seems to depend much more on the cultural history of each separate region than on geographical factors. Finally, there is no reason to consider that the rudimentary agriculture of the great majority of the savanna tribes was recently acquired. These remarks lead to the following conclusion: The characteristics both of farming and of the exploitation of wild plants in South America show that their place of origin was the Tropical Forest or the banks of the northern streams which are naturally bare and remain uncovered by water during most of the year (Roth, W. E., 1924, p. 214; see also Sauer, this volume, pp. 331–344). This Silval culture, based altogether on farming and on the exploitation of wild resources, which requires as much skill as farming, is the only genuine culture of tropical South America. (See also Handbook, vol. 3, pp. 883–886, on the two culture types in the Tropical Forests.)

All South American tribes clung to the forest whenever they were forced to change their habitat. This was true in the case of the *Tupí* during their long and widespread migrations. Petrullo (1932) noticed that the inhabitated area of the Xingú River begins only at the points where the gallery forest becomes a true rain forest spreading inland. The savanna, where manioc does not grow, is always avoided and probably was occupied only by tribes driven into it by stronger populations. In the savanna the horticultural pattern was partially retained by turning to the best possible account the strips of gallery forest along the streams. It was sometimes improved, as shown by Nimuendajú's discovery among the eastern *Ge* of a cultivated *Cissus* not reported elsewhere. Farming was abandoned in favor of hunting (*Bororo*) or of collecting and gathering wild foods, or of both. But there is little doubt that all nonhorticultural South American tribes were formerly farmers. The well-known text by Karl von den Steinen (1894) about the behavior of the *Bororo* in the presence of the gardens opened by the Brazilians is of little weight when compared to the fact that these very Indians were acquainted with an elaborate harvest ritual. Farming might have been forgotten among some *Bororo* as a result of the abundance of game along the marshes, but agriculture was not new to them.

Utilization of wild foods exists in the tropical area on two different levels: a basis level, in which it coexists with farming and is centered in or around the forest; and a subsidiary level, which is one of collecting brought about by compulsive adaptation to the savanna and which often remains partial and is always secondary.

THE PALMS

Several species of palms played an outstanding part in native cultures. Thus, for instance, Gumilla (1791, 1: 145) remarks that the muriche palm (*Mauritia flexuosa*) was the mainstay of the *Warrau* economic life. From it these Indians obtained wood for their pile dwellings, fiber for their clothes, ornaments, hammocks, and fishing tackle, starch for making bread, sap for their wine, the fruits for a sort of punch, and leaves for their baskets. They also extracted large edible larvae from its decayed trunk.

The pupunha, or peach palm (*Guilielma gasipaes*), is a palm long cultivated by the Indians, though it still grows wild. The edible fruit of the cultivated tree lacks the thick shell characteristic of the wild varieties. Palms are semicultivated, for wild palm trees are often spared on a clearing and tended together with the cultivated plants.

About 20 genera of palms were widely used, being exploited for the following purposes:

Edible fruits.—Several genera yield nuts which are edible after the shell of the fruit has been broken. Most important in the native diet are the uaguassú (baguassu, babassu), or pindoba nut (*Orbignya speciosa*), which is rich in oil, and the nuts of the genera *Acrocomia*, *Astrocaryum*, *Attalea*, *Catoblastus*, *Cocos*, *Copernicia*, and *Maximiliana*, which have different food values.

With other species, it is not the nut but the fleshy substance surrounding it which is consumed. Both the nut and the flesh are eaten of the mucaja or bacaiuva (*Acrocomia*), but only the flesh is eaten of the caranai (*Mauritia horrida*) and the buritî (*Mauritia vinifera*) in central and western Brazil, and of the miritî or ite (*Mauritia flexuosa*) in Amazonas and Guiana. This fruit is all-important in the diet of many tribes, because of the many vitamins contained in the mush prepared with its orange-yellow pulp. Thevet (1878) describes the uricuri or buri da praia (*Diplothemium maritimum*), a small tree with edible fruits relatively abundant between Rio de Janeiro and Cabo Frio.

The fruits of several palm tree genera are used only to prepare beverages or mushes. The most important are the assai (*Euterpe oleracea*, *E. precatoria*), the manicol (*Euterpe edulis*), the bacaba or turu (*Oenocarpus distichus*, *O. bacaba*), the lu (*Oenocarpus* sp.), the patua or pataua (*Oenocarpus patua*), the aeta (*Mauritia flexuosa*), the kokerit or anajá (*Maximiliana regia*), the awarra or jawari (*Astrocaryum tucumoides*), and the marajá (*Bactris minor*). In most cases the ripe palm fruit is soaked in lukewarm water—boiling water would harden instead of softening them—and then the pulp is separated from the shell or kernel and made into a thick, oily, fragrant drink, which has a high nutrient value. These drinks may be consumed immediately or after standing a night, which gives them a slightly sour taste. Sometimes manioc flour is added to them.

Palm wine.—The sap of the *Mauritia vinifera* is drunk fresh or slightly fermented. It is collected in a trough-shaped cavity dug in the trunk of a felled tree (*Warrau*). The coroxo wine is made from the fruits of the *Acrocomia aculeata*. (See also Handbook, vol. 1, p. 418.)

Palm cabbage or palmito.—The "palmito," i. e., the terminal shoot of several species of palm, is one of the few fresh vegetables in native diet. It is eaten raw, broiled, and sometimes boiled. The palmito of almost all the palm species can be consumed, but some have a bitter taste, as for instance the *Acrocomia*. The Brazilian Indians show a marked preference for the palmitos of the *Euterpe*, *Cocos*, and of several species of *Iriartea*. In the Chaco, the Indians consume the palmitos of the caranday (*Copernicia cerifera*).

Starch.—The *Warrau* extract starch from *Mauritia* in the following manner:

> When an ite tree begins to fructify it is cut down, a large slice is cut off one side, and the stringy substance of the interior is cut into shreds, the remainder of the trunk serving as a trough, in which it is triturated with water, by which is disengaged a considerable quantity of starch. The fibrous particles are then extracted, and the sediment, or aru, formed into molds like bricks. This is spread out on stones or iron plates over the fire, and makes a very nutritive but at the same time unmasticable bread. [Roth, 1924, pp. 215–216; cf. Gumilla, 1791, 1: 149.]

This starchy food is known under the name of sagu in northern and eastern Brazil (Pio Corrêa, 1909). The *Guayakí* extract a starchy flour from the pindo palm (*Cocos romanzoffiana*) (see Handbook, vol. 1, p. 436; also Vellard, 1939, p. 84).

Oil.—Oil can be extracted from several palm fruits by crushing and boiling them. It may be used in cooking, for lighting purposes, or in medicine; but more often the Indians mixed it with urucú or some other pigment to smear on their bodies. The palm species which produce oil are: *Orbignya speciosa*, *Astrocaryum tucuma*, *Astrocaryum tucumoides*, *Attalea speciosa*, *Maximiliana regia*, and *Oenocarpus* (*O. bacaba* and *patua*).

Salt.—The ashes of the fibers and of the fruits of some palm trees, such as jara (*Leopoldinia major*), and of the leaves of some other species, such as *Mauritia flexuosa*, are boiled and the decoction is allowed to evaporate in order to obtain a brownish powder which is used as salt. Staden (1928, pt. 2, ch. 11) saw and describes the whole process among the ancient *Tupinamba:* From the ashes of a palm trunk, they make a solution which they boil until the salt is separated. "It tasted like salt and was grey in colour."

House thatching.—Palm leaves are the most common plant materials for thatching the roofs and frames of native huts. The method of thatching depends upon the nature of the leaves. If the fronds are paripinnate, such as those of the anajá, the leaflets are made to fall limp and loose by tearing loose the "eye," i. e., the internal articulation of the leaves with the midrib. The palms are attached horizontally to the purlines, overlapping like tiles. For fan-shaped leaves, the techniques are more elaborate. The ancient *Tupinamba* parched the leaves of the pindoba over a fire and then plaited them before thatching their huts. Among the Guiana Indians, palm leaves preferred for thatching are: the truli or bussú (*Manicaria saccifera*), caranai (*Mauritia horrida*), burití or ite (*Mauritia vinifera*, *M. flexuosa*, or *M. armata*), dallibana (*Geonoma baculifera*), ubim and several *Geonoma* (*G. elegans*, *G. paniculata*, *G. pohliana*, *G. schottiana*), anajá or kokerit (*Maximiliana regia*), manicol (*Euterpe edulis*), turu or bacaba (*Oenocarpus bacaba*), assai (*Euterpe oleracea*), etc. (Roth, W. E., 1924, pp. 265–270).

Basketry.—Max Schmidt (1905) classifies twilled basketry in two classes depending on whether fan-shaped or paripinnate leaves are used. He believes that many decorative motifs in the art of these Indians come from the basketry patterns that are inevitably produced by using fan-shaped burití palms.

Paripinnate leaves, such as those of *Maximiliana regia*, *Orbignya speciosa*, *Orbignya phalerata* (cusi of the Chaco), two species of *Astrocaryum* (respectively, awarra and akko-yuro in the Guianas, tucúm and tucumá in eastern Brazil, murumuru or *Astrocaryum murumuru* in the Amazon, and several species of *Desmoncus* (kamwarri or jacitara) are particularly suitable for making fans, mats, and temporary carrying baskets.

With the fan-shaped leaves of the burití or ite palm, the Indians of eastern Brazil weave fire fans, containers, trays, and rectangular baskets which are characterized by geometrical patterns (lozenges, etc.).

Twine, cords, and strings.—The young unopened leaves of the *Mauritia flexuosa* reduced to the cortical strips and soaked in water for several days are made into cords which have many uses in the Amazon Basin. The fibers of several *Attalea*, mainly those of the piacaba (*Attalea funifera*) or chiquichiqui (*Leopoldinia piaçaba*) provide material for thick or small ropes. The name "tucúm" is given to several species of palm trees, mainly *Astrocaryum* or *Bactris*, particularly *Bactris setosa*, which give excellent fibers for strings and ropes used for making hammocks, nets, etc. These species are as important to the Indians of the Amazonian or Orinoco Basins as the Bromeliaceae known as caraguatá are to the Indians of the Chaco. The name "jupati" is given to plants of the genus *Raphia*.

Wooden objects.—Posts, fences, and palisades are often made of the wood of the catizal or paxiuba (*Socratea exorrhiza* and *Socratea durissima*). The natives of eastern Bolivia and the upper Amazon make their bows of the hard, black wood of chonta palm (*Guilielma insignis*). Clubs and spears are often carved of the same wood. The stem of the paxiuba (*Socratea exorrhiza*) serves to encase the *Arundinaria* tube of the blowgun. The gigantic trumpets of the Uaupés River Indians are made of sections of paxiuba palm (*Socratea exorrhiza*) wrapped with long strips of iebaru (*Eperua grandiflora*). Finally, the vegetal wax of the carandai or carnauba palm tree (*Copernicia cerifera*) must be mentioned here. This species is especially important in northeastern Brazil. Nordenskiöld (1929 a, fig. 1) has published a *Chacobo* manioc grater from Bolivia. It consists of a section of the trunk of a thorny palm tree. Often, to make a grater, thorns are imbedded in rows in a wooden plank.

Beads and ornaments.—The black polished shells of the small nuts of the *Astrocaryum* are practically everywhere carved into beads, earrings, and other types of ornaments. The wood of other palm trees is occasionally used for miscellaneous purposes. These are pati (*Orcus* sp. and *Cocos botryphora*), buri and buri-assu (*Diplothemium caudescens*, *D. campestre*), aracuri (*Cocos coronata*), curua or acuri or auacuri (motacu in the Chaco), several species of *Attalea* (*A. speciosa*, *A. phalerata*, *A. princeps*, *A. spectabilis*), buritirana (*Mauritia aculeata*) etc.

TIMBER WOOD

The number of species of trees used by the Indians in their industries is so large that a complete list would fill a volume. Here are enumerated the names of species most frequently mentioned in the old literature dealing with the culture of the Brazilian Indians.

Several kinds of aroeira are used: aroeira branca (*Lythraea moleoides*, *L. brasiliensis*), aroeira molle (*Schinus molle*, which also yields the so-called American mastic), and aroeira vermelha (*Schinus terebinthifolius*).

"Cedro" comes from several families of plants: imbuia (*Bignonia* sp.); cabreuva (*Myrocarpus* sp.); acareuba (*Calophyllum brasiliense*); conduru, a red wood (*Brosimum conduru*); ubiraeta or iron wood (*Caesalpinia ferrea*); barauna (*Melanoxylon brauna*); jurema (*Pithecellobium tortum* and *Mimosa verrucosa*); ivory white or "pau marfim" (*Balfourodendron riedelianum*); red guarabu (*Peltogyne confertiflora*); black caviuna or jacaranda (*Dalbergia nigra*); "Vinhatico," a yellow reddish wood (*Plathymenia reticulata*); and piquihi (*Caryocar barbinerve*). The genera *Tecoma* and *Couralia* provide various reddish and blackish woods. Jatahi and jatoba are trees of the genus *Hymnenaea;* macarandiba is *Lucuma procera;* guapeveira is a species of *Chrysophyllum;* andira or "pau de morcego" is *Andira rosea* or *A. fraxinifolia;* jequitiba is *Couratari brasiliensis;* sucupira is *Bowdichia virgiloides* and *Pterodon pubescens;* arariba or araruva, a striped wood, is *Centrolobium robustum;* urucurana is *Hieronymia oblonga* and a species of *Alchornia.*

In addition, several palms, especially *Orbignya*, *Astrocaryum*, *Guilielma*, and *Iriartea*, are used for hut frames, weapons, fences, etc.

Some woods are traditionally used for making specific objects. Clubs and macanas are generally carved of the hard wood of various Leguminosae, especially purpleheart (*Copaifera pubiflora*, *Caesalpinia* sp., and *Myrocarpus* sp.), snakewood (*Brosimum aubletii*), and amara (*Schwartzia tomentosa*). The *Tupinamba* used ibiratinga (*Funifera* sp., of the family Thymelaeaceae) to make the staves of their spears. The Guiana Indians made their best paddles of the fluted projections of the yaruru or paddle wood (*Aspidosperma excelsum*); the *Tupinamba* of *Genipa americana* or of uaca (*Ecclinusa ramiflora*).

The light woods or "gameleiras" include a great many species of *Ceiba* (e. g., copaubucu, *Ceiba erianthos*) and *Ficus*, as well as ubiragara ("barriguda," or "barrigudo" tree, *Cavanillesia arborea*, and several other *Bombacaceae*), umbaubeira (*Cecropia adenopus*), apeiba (*Apeiba* sp.), and paraparaiba (*Cecropia* and *Triplaris*).

These light woods are used mainly for making ear or lip plugs (*Suya*, *Botocudo*, etc.), cylindrical containers for feathers and ornaments (*Bororo*, etc.), rafts or jangadas (on eastern Brazilian coast, *Apeiba* sp. or apei is used), and canoes (*Cavanillesia arborea* and *Ceiba pentandra*).

Canoes.—In Guiana, canoes and corials were made out of the following trees: Siruaballi (*Nectandra* spp.), tenyari or mara (*Cedrela odorata*); purpleheart (*Copaifera pubiflora*), kabukalli (*Goupia glabra*), itenalli (*Vochysia tetraphylla*), silk-cotton tree (*Ceiba pentandra*), crab-wood (*Carapa guianensis*), incense tree (*Protium guianense*), *Dimorphandra mora*, and several species not yet identified. In northern Brazil canoes were dug out of the trunks of *Cedrela odorata* and *Ceiba pentandra*. The Indians of central Brazil make their canoes from the bark of jatoba (*Hymenaea courbaril*). The same bark was probably used by the *Tupinamba*. The *Tupí* dug canoes out of a Bombacaceae or of *Ficus doliaria*. *Iriartea ventricosa* is used for the same purpose.

Bows.—In the Guianas bows are made from at least half a dozen different timbers. Those which have been identified are the purpleheart (*Copaifera pubiflora*), burakura, burukuru, burokoro, leopardwood, or snakewood (*Brosimum aubletii*), and *Lecythis ollaria*. In Brazil the most common bow wood is *Tecoma conspicua*, called for that reason pau d'arco.

Perfumed woods.—Beads of necklaces are often carved from fragrant woods. These are: carunje (species of *Ocotea* and *Nectandra*), vanilla (*Vanilla* sp.), cinnamon wood or anhaybataa (*Pseudocaryophyllus sericeus*, *Cinnamodendron axillare*, and *Capsicodendron pimenteira*), rosewood or jacaranda (*Dalbergia nigra*), and pau santo (species of *Bulnesia* and *Zollernia*).

Certain other woods have an unpleasant odor: ubirarema or "canella merda" (*Nectandra myriantha*), pau d'alho (*Gallesia scorododendrum*), and several vines which smell like garlic (*Lundia longa*, *Clytostoma noterophilum*, *Segueira floribunda*, *Adenocalymna alliaceum*, etc.).

FIBERS

Fibers used by tropical Indians in their industries come mainly from palm trees (see p. 472). Fibers are also extracted from several Bromeliaceae, mainly *Bromelia fastuosa* and *B. serra*, which are known as caraguatá, gravata (*Tupí*), chaguar (*Quechua*), pita, kuraua, etc.

In the Guianas and in many regions of Brazil, the Indians utilize the fibers of both palm trees (tucúm) and of bromeliads, though the first give thinner and better strings. In the Chaco and southern Brazil, the Indians employ almost exclusively fibers of Bromeliaceae.

In Colombia, Ecuador, and Perú, the Indians obtain the fibers for their ropes and textiles from the agave.

The Brazilian Indians use vines and creepers of many species for ropes, cables, or strings. Those called cipo belong to many families and genera. Cipo-embê is the adventitious root of a plant of *Philodendron.* The timbó group includes thinner varieties of vines (*Serjania* and *Paullinia*) which may be twined or plaited. Timborana (*Lonchocarpus* sp. and *Malpighiaceae* sp.) serve the same purposes. In the northwestern parts of South America, the name bejuco is given to *Vitis tiliifolia, Trichostigma octandrum, Entada gigas,* etc.

Roth (1924, p. 118) lists nibbi or sippi, mamuri, and muna (*Carludovica* sp.) as bushropes which in their natural condition may be used as twines.

Paina (*Chorisia speciosa*), embiriti (*Bombax munguba*), and goayaimbira (*Cecropia concolor*) are trees which yield a fibrous substance used by the Indians. The cottonlike wads which the Indians attached to the buts of blowgun darts come from the fruits of *Bombax globosum* and *Eriodendron samauma.*

Bark cloth.—Bark cloth may be obtained from several species of trees. In eastern Bolivia and on the upper Amazon the Indians use bark of trees of the genus *Ficus,* which are known in Bolivia as bibosi. From the Guaporé to the Orinoco River cloth is made from the bark of species of *Bertholletia* and *Cariniana;* in the northern parts of the continent and in the West Indies, from cabuya (*Fucraea gigantea*), majagua (*Hibiscus tiliaceus*), memiso (*Muntingia calabura*), and manbarakrak (*Lecythis ollaria*); and in eastern Brazil, the bark of embiriti (*Bombax munguba*).

MISCELLANEOUS

According to Von den Steinen (1894), the Xingú River Indians cultivated a wild grass which they used as razor blades. The fruit of a Bignoniaceae ("pente de macaco," *Pithecoctenium echinatum*) was used as a comb by the *Tupí* and other tribes. The *Tapirapé* use the fruits of a grass ("capim flecha," *Streptogyne crinita*) as tweezers for plucking the hair (Baldus, quoted by Hoehne, 1937, p. 115).

As the two more important fruits used as containers were cultivated (*Crescentia cujete,* cuia, güira, and *Lagenaria siceraria*), only the shell of *Lecythis blanchetiana* (one of the numerous sapucaia nuts) and the hollowed-out seeds of several palm trees (*Astrocaryum*) and the staunch flour containers made from the leaves of *Heliconia* and *Calathea* may be mentioned here. The leaves of *Heliconia bihai* and of several *Geonoma* were also used for roof and wall thatching.

The calabashes of the upper Rio Negro are lacquered with a decoction of carayuru—Bignoniaceae and cassava leaves sprinkled with human urine (Roth, W. E., 1924, p. 302).

In addition to numerous palm nuts (see The Palms, p. 469), a great many nuts (genera *Bertholletia* and *Lecythis*) and seeds ("olho de cabra" or comedoi: *Ormosia nitida, Omphalea diandra, Myroxylon toluiferum,* and others) are used as beads in necklaces, tassels, and the like. Several hard-shelled seed pods, including *Thevetia peruviana* and *Juglans* sp., were made into rattles for accompanying songs and dances. Also used for rattles in Guiana were many nuts and seeds known only by their local names: Kawa and cerewu or cerehu seeds and caruna and ahouai nuts. The hollow cylinders used to strike the ground as a dance accompaniment are made of trumpet wood (*Cecropia*) or bamboo (*Gadua*). The drums of the Orinoco are hollowed from the trunk of several trees: silverballi (*Nectandra*); karuhoho (*Arawak*), simaruba (*Warrau*) or muratatau (*Carib*); omu (*Warrau*); and sometimes of *Mauritia flexuosa* (Roth, W. E., 1924, pp. 464–466). Bundles of palm leaves (*Maximiliana maripa*) enter into the construction of the *Oyana* drums dug in the ground and struck with the feet (ibid., pp. 468–469).

GUMS AND RESINS

Most of the gums known to the Indians are obtained from the Leguminosae. They are generally used as drugs, but may also be employed in the native industries.

Lighting substances.—All kinds of rubber burn quickly with a bright flame. In addition to its other industrial uses, rubber is collected in lumps of coagulated latex and carefully kept to light fires. The lump is drilled with the fire drill, which produces a highly inflammable dust. The rosin of the locust tree (jatoba, jatahi, simiri, algarroba—names which in different regions are given to the same or different species: *Hymenaea courbaril, Cassia blancheti,* and others) when lighted or thrown in a fire gives a brilliant light. Guaconax (*Amyris maritima*) and almecega (*Hedwigia balsamifera* and *Protium heptaphyllum,* the latter "the haiowa of the *Arawak,* shipu or sibu of the *Warrau,* and sipipio of the *Carib*" (Roth, W. E., 1924, p. 80)) serve the same purpose.

Plastic substances.—On the upper Guaporé River, the translucent rosin of *Hymenaea courbaril* and probably of many other trees is made into nose and lip plugs by means of wooden molds. The *Guaraní* used the rosin of a tree called abati timbabȳ in the same way. Several rosins are applied as a glaze to the whole or to parts of newly fired ceramics: in southern Brazil, Paraguay, and northern Argentina the rosin of "pau santo," "palo santo" (*Bulnesia sarmienti*); and in the north, that of icica (*Protium brasiliense, P. heptophyllum, P. guianense, P. aracouchili, P. carana*) and of *Hymenaea courbaril.* The *Nambicuara* make their pots waterproof by washing them when still hot with a decoction of the rosinous bark of a *Mimosa.* The same thing is said of the *Warrau* (Roth, W. E., 1924, p. 133).

Gums and glues.—The rosins already mentioned and especially that of balata or turara (*Mimusops globosa*) and of "pau breo," manni, ohori, or manil (*Moronobea coccinea*) are widely used for fastening points and feathers to arrows, for waxing threads, for calking canoes, and for attaching stone chips or thorns on cassava graters, blades to knives, and axes to their handles.

Balsams.—The rosin of the *Hymenaea courbaril* is chewed for pains in the stomach and flatulence, and is burned for fumigations in case of colds and headaches. The balsam of acouchi (*Protium* sp.), umiri (*Humiria floribunda*), and wallaba (*Eperua* sp.) are said to heal wounds. The same virtues are ascribed by Indians and Whites to *Copaifera multijuga*, *C. officinalis*, and *C. langsdorfii*, which are known as copayba, cabima, curucay, curaki, purukai, mawna, mararen, and maran.

Corohiba or cabureiba (*Myroxylon toluiferum*, the tolu balsam of Colombia and Venezuela) is popular with the Indians of central and southern Brazil. According to Soares de Souza (1851), the ancient *Tupinamba* collected it with pads of cotton, which they later squeezed.

Other balsams used by the tropical Indians are: cabreuva (*Myrocarpus frondosus*, *M. fastigatus*), obira (Apocynaceae), imbauba or ambay (*Cecropia adenopus*), corneiba (*Schinus terebinthifolius* or *Lithraea brasiliensis*), and gayac (*Guaiacum officinale*).

The *Guayba*, *Tunebo*, and *Chiricoa* used a rosin called mara (*Protium* sp.) for hunting deer, which are said to be attracted by its odor.

OILS AND UNGUENTS

To make oil of crab wood (caraba or andiroba, *Carapa guianensis*) "the Roucouyenne of Cayenne . . . preserve the seed for a year by burying it in the ground and making veritable silos of it . . . The Oyampi of the Oyapock River boil the seeds, expose them for several weeks to the air in a scooped-out tree trunk, crush them with their feet, and finally let them drip on an inclined palm leaf" (W. E. Roth after Crévaux, 1924, p. 85). The oil is used to anoint the hair and skin and to prepare paint. From makeima bark (*Mespilodaphne pretiosa*, Roth, W. E., 1924, p. 86) the *Macushí* extract an ethereal oil for use against diarrhea and dysentery. Most species of Lecythidaceae, some of *Eugenia* and *Virola*, and *Bertholletia excelsa* (the Brazil nut) have fruits which, when boiled and crushed, yield an oil or a vegetable tallow which may be used as a food, as an unguent, or for lighting purposes. Palm oils are described under The Palms (p. 471).

PIGMENTS AND DYES

The most important pigment in all tropical South America is certainly the urucú or roucou (called achiote in México, mantur in

Quechua, bija in the West Indies, and, in other dialects, arnotta, faroa, kuseve, shiraballi, mubosimo, and majepa). *Bixa orellana* is cultivated by most tribes, although many of them merely transplant young wild plants to places near their huts. *Bixa orellana* is, however, a widespread wild plant and thus belongs to the large group of plants which have not been modified through cultivation. The red pigment of the urucú comes from a thin skin covering the seeds. These are washed and mashed, and the pigment, which settles to the bottom of the container, is dried, mixed with animal or vegetal oil or gum, and made into balls or cakes. Urucú dye is used to color cotton thread and to paint weapons, ceramics, and implements, but it is employed especially to anoint the body and even the hair. Whether this widespread custom has a predominantly esthetic or hygienic function (protection of the body against heat and insects) is a much-debated question. In northern Argentina, where cultivation of *Bixa orellana* is difficult, a decoction of pariah bark (*Simaruba*, *Simaba*, and *Pricrasma*) or "palo amargo," is used instead. Bodily ointments are also made from guavira (*Campomanesia*), taperihuá (*Cassia*), caburehi (*Myrocarpus*), and isipo kati (*Aristolochia*) (Pardal, 1937, pp. 99 ff.). Thevet (1878), Léry, Gomara, and others have described the unguent used against body parasites and made of hiboucouhu; Hoehne considers this plant a *Myristica* (Hoehne, 1937, p. 126).

Another red paint used for body and pottery decoration and varying from orange to purple according to the technique of preparation is caraweru, barisa, barahisa, biauro, etc., which comes from the boiled or fermented leaves of *Bignonia chica*. It is kept in small straw baskets or in tubes. Unripe *Genipa* fruit of the jagua or xagua, launa or lana, tapuriba, tabuseba, etc. (*Genipa americana*) yields a juice which becomes black or dark blue when exposed to the air. From Argentina to the Guianas, it is used as a dye and as a paint for the body and for pottery and utensils. The tree is sometimes cultivated but also occurs wild. From arrisaura or karasaru berries the natives of the Guianas extract a clear blue used for body paint.

The following dyes are used more for native handicrafts than for the body: "Pau brasil" of the old travelers or oroboutan of the *Tupinamba* (*Caesalpina echinata*), used to dye feathers red; other red dyes are yzipo roots mentioned by Dobrizhoffer (1822), mespil or itarra (*Bellucia aubletii*) used in the Guianas to paint the paddles, the inside of calabashes, etc., maba bunakara (*Coussapoa latifolia*) and buri-badda (*Homalium ?*), *Maparakuni erythroxylum* of the northeastern *Arawak*, and kuruwatti (*Renealmia exaltata*) used as a remedy for ophthalmia, as a dye, and on the Pomeroon supposedly as the pigment for tattooing in the old days (Roth, W. E., 1924, pp. 90–91).

Besides *Genipa americana*, a black dye is extracted from inga or shirada bark (*Inga lateriflora*). It is mostly used in basketry. Several yellow pigments come from tatajiba or tayuva (*Chlorophora tinctoria*), which has an edible fruit, and from an unidentified plant which Soares de Souza called caapiam (Hoehne, 1937, pp. 241–242). A blue, indigolike dye comes from *Anil trepador* (*Vitis sicyoides*) and from anil-assi (*Eupatorium* sp.). The old literature mentions several other vegetable dyes which are not yet identified. The sakuapéra of the *Arawak* and *Warrau* is *Henriettea succosa* (Roth, W. E., 1924, p. 90).

SHAMPOOS

Shampoos include the Brazilian "arvore de sabão"; this is the Guiana and West Indian "I" of the *Taino*, identified by Roumain (1942, pp. 65–66) as *Gouania lupuloides* or *G. polygama*, certain roots and fruits of *Sapindus divaricatus* used by the *Tupí*, cjaru (*Colletia spinosa*) of Bolivia, Chile, Uruguay, and Argentina, and *Sapindus saponaria* of Venezuela, Brazil, and Argentina.

RUBBER

According to W. E. Roth (1924, pp. 83–84), *Sapium jenmani*, or *S. cladogyne*, and some species of *Hevea* were probably the original sources of rubber. The *Omagua* made balls, rings, and syringes from the milky sap of a creeper which, from the structure of its fruits and flowers, must be ascribed to a genus of the Apocynaceae.

The rubber balls of the *Paressí* and *Nambicuara* are made of the latex of mangabeira (*Hancornia speciosa*). The name "caucho" (rubber) is given to *Castilla elastica* and to *Sapium eglandulosum*. The rubber latex of soveira or sorveira (*Couma guianensis*, *C. macrocarpa*, *C. utilis*) can be drunk either pure or diluted with water. The Indians coat their skin with the latex of several rubber trees in order to suffocate parasite worms lodged under the epidermis.

FOODS

Tubers.—Wild food plants include roots, fruits, nuts, and shells. Few tubers have been identified, because the Indians generally collected them only in time of scarcity, when they were substitutes for manioc, *Dioscorea*, *Zanthosoma*, and other cultivated tubers. Among the wild tubers eaten is mandioquinha do campo (*Zeyheria* sp.).

Green vegetables.—Green vegetables are scarce in native diet, being limited to manioc leaves, palm shoots (q. v.), a species of *Cissus*, which Nimuendajú found cultivated among the eastern *Ge*, and a very few others.

Nuts and seeds.—Besides palm nuts (p. 469), which are consumed from the Chaco to the Guianas, there are two other nuts of great value.

The *Caingang* and *Guaraní* of southern Brazil depend for several months each year on the nuts of *Araucaria angustifolia.* The *Tupí* called these iba, the fruit "par excellence." To the *Araucanians* they are just as important. In the Amazon Basin, sapucaia (*Lecythis ollaria* or *L. pisonis*) and Brazil nuts, tocari (*Bertholletia excelsa*), are not negligible items of native diet. These nuts were a favorite food among many tribes of the Beni and the Madre de Dios Rivers.

Other nuts with food value for the Indians are those of piqui ("Almendras del Brasil"), sawari or chachapoya (*Caryocar barbinerve, C. brasiliense, C. tuberculosum, C. amygdaliforme*) comanda-iba (*Sophora tomentosa*), comanda-assu (*Mucuna altissima*), and jatoba or locust tree (*Hymenaea courbaril*).

In the Guinas, cassava flour is often increased, mixed with, or even replaced by flour made of the following seeds. Mora (*Dimorphandra mora*), greenheart (*Nectandra rodiaei*), dakamballi (*Vouacapoua americana*), pario, and nuts of the sawari tree (*Caryocar tuberculosum*). W. E. Roth (1924, pp. 219, 230) quotes Schomburgk on the occurrence of wild maize (?) on the eastern foot of the Pacaraima Range. Not only seeds and nuts are occasionally added to cassava flour, but also soft wood.

Wild rice (*Oryza subulata*) is abundant in Uruguay, Rio Grande do Sul, in the marshes of the upper Paraguay and of the Guaporé Rivers (Hoehne, 1937, pp. 33–39), and in the Orinoco Valley, but the Indians of the last region do not seem to have consumed it. According to Hoehne, *Oryza sativa* may be aboriginal in South America.

Although peanuts (*Arachis hypogaea, A. nambyquarae*) were generally cultivated, "southern Brazil, and particularly São Paulo, Paraná, and Mato Grosso, is the land of origin of the different peanuts. All known species still exist there in wild state . . ." (Hoehne, 1937, p. 216).

Fruits.—Some widely distributed fruits were used both cultivated and wild: caraguatá (*Bromelia fastuosa*); inga, shirada, or pacay (*Inga vera, I. lateriflora, I. bahiensis, I. fevillei*); maracuja (*Passiflora quadrangularis, P. alata, P. edulis*); and pineapple (*Ananas sativus*). The use of the following centers around the Chaco, southern Brazil, southern Bolivia, and northern Argentina: The important algarroba or aloja (*Prosopis alba*), principally used as a drink; guabiroba (*Myrtus mucronata* and *Psidium multiflorum, P. corymbosum, P. cinereum, P. guazumaefolium*); guavira (*Campomanesia*); tamarin, common in the Chiquitos region but lacking in Paraguay, according to Dobrizhoffer; tusca (*Acacia aroma*); taruma (*Vitex montevidensis*); and chañar (*Gourliaea decorticans*). A curious use of quebracho, wood yielding tannin, may be mentioned here:

> The Guaraní burn pieces of the tree *tayӯ*, receive the smoke or soot arising from them into a clean dish, and by pouring hot water upon it, convert it into ink which

mixed with gum and sugar is by no means to be despised. [Dobrizhoffer,1822 1: 398.]

The "fructa do lobo" (*Solanum grandiflorum*, yielding the alcaloid, grandiflorina) has a central and southern distribution in the savanna lands of central Brazil. Its delicious large peachlike fruit seems to be the object of a food prohibition in several regions. Some varieties may be toxic.

Cashew (*Anacardium occidentale*) is generally cultivated, but another wild species, *Anacardium giganteum*, yields small fruits which the Indians collect at the foot of the tree after the monkeys have thrown them down. The Brazilian Indians consume the fruits of several other species of Anacardiaceae: umbú (*Spondias tuberosa*), hobo, jobo (*Spondias monbim*, *S. dulcis*, *S. robe*), caja-mirim, maropi or hog-plum (*Spondias lutea*), and acaju or acaja (*Spondias monbim*). The tuberlike roots of umbú are edible.

Mangaba fruits (*Hancornia speciosa*) are so important to the savanna tribes that when they are in season the Indians undertake large expeditions for the sole purpose of collecting them. Likewise of great importance are the fruits of several *Psidium* (*P. turbiniflorum*, *P. guayava*, *P. variabile*), and of several *Myrtaceae*, such as cambuy and jaboticaba (*Mouriria pusa*), both common trees in eastern Brazil.

The following species yield fruits which are eaten occasionally by the Indians: Cambuca (*Myrcia* sp.), massaranduva or macarandiba (*Lucuma procera*), mucugé (*Couma rigida*), ubauba (*Pourouma cecropiaefolia*), ubacaba (*Britoa triflora*), murici (*Byrsonima*), canapu (*Physalis pubescens*), *Cereus* sp., *Eugenia* sp., *Genipa macrianae* and *G. edulis*, *Malpighia* sp., "banana do brejo" (*Mostera deliciosa*), etc.

In the northern part of the continent and in the Antilles, fruits eaten include the following: Oiti coro (*Couepia rufa*), oiti da Bahia (*Moquilea salzmannii*), piquia (*Macoubea guianensis*), bacopary (*Rheedia brasiliensis*), icaco (*Chrysobalanus icaco*), bacury (also cultivated) (*Platonia insignis*), abio (*Lucuma caimito* and *Pouteria caimito*, which are different from the caimite of the West Indies, *Chrysophyllum caimito*), the mammee apple or "abrico do Para" (*Mammea americana*, to be distinguished from the mamey of Cuba, *Calocarpum mammosum*), several species of *Couma*, several Annonaceae (*Annona muricata*, *A. reticulata*, araticu), and several species of cacao (*Theobroma cacao*, *T. bicolor*, *T. grandiflorum*, *T. speciosum*). The wild kakaui (*Theobroma sylvestre*) and the "cacau selvagem" (*Pachira insignis*), which are eaten raw, are important food items for the tribes of the upper Madeira River (Lévi-Strauss, ms.).

Some kinds of mushrooms were consumed on the Orinoco, and are also considered a delicacy by the *Nambicuara*.

DRINKS

When no water is available, the Indians know how to quench their thirst with the sap of several vines and creepers. This sap resembles pure, clear water, and it can be gathered easily in a calabash. The best known vine is the waterwhithe (*Vitis* sp., *Entada polystachya*) and salisali (*Lonchocarpus rufescens* or *Lonchocarpus nicou*), a creeper also used for drugging fish. Its water is clear and fresh, but only its first flow can be drunk, because later it becomes white and milky, and is toxic (Crévaux, 1883, p. 278).

In periods of drought the *Arawak* of Pomeroon obtained water from truli fruits (*Manicaria saccifera*). Water may also be obtained from the sheath bases of the leaves of several plants: some *Tillandsia*, the burití palm (*Mauritia flexuosa*), and caraguatá (*Bromelia* sp.).

A great many beverages, some of them fermented, are prepared from the fruits, seeds, and roots of wild plants. A popular liquor is made with the cultivated and wild pineapples (*Ananas sativus*). The ancient *Tupinamba* prepared a fermented beverage with cashews (*Anacardium occidentale*). In the Chaco, beer is made with chañar (*Gourliaea decorticans*), mistol (*Zuzyphus mistol*), tusca, and algarroba pods (*Prosopis*), etc.

Refreshing drinks are obtained from hitchia (*Byrsonima spicata*), hlawaraballi (*Protium heptaphyllum*), guavira (*Campomanesia*), and several species of *Psidium* sp. and *Eugenia* sp.

CONDIMENTS

The preparation of salt from the ashes of leaves or fibers of some palm trees has been described (see The Palms, p. 471). Another type of vegetable salt is obtained by boiling an aquatic plant, oulin, weya, weira, weyra, or huya (*Mourera fluviatilis*). It is a dirty brown and inferior in quality. Roth, who describes its preparation among the Guiana Indians, considers it the same as the caruru salt mentioned by Coudreau (Roth, 1924, p. 223), and it is probably the same as the *Trumai* salt made from waterlilies (Quain, ms.; see Upper Xingú, Handbook, vol. 3, p. 326). Numerous tribes, for instance the *Nambicuara*, cannot bear the taste of salt, but tribes which do enjoy it use native salt, bitter as it is, in large quantities. There is, in fact, a strong contrast in the like and dislike of various tribes for "hot" foods.

Peppers (*Capsicum*) are usually cultivated, but wild peppers (*Capsicum rabenii, C. baccatum*) occur on the Brazil coast (Soares de Souza, quoted by Hoehne, 1937, p. 218). The coastal *Tupí* used a "long pepper which is crushed together with salt, pinches of which are swallowed after each mouthful"; this may be *Piper longum* or the bitter grass jambi or nhamby (*Eryngium foetidum*), which was also known to be used as a condiment (Hoehne, 1937, pp. 157–158, 252). Jambi has also been identified as *Ageratum conyzoides.*

The *Nambicuara* flavor "tonka beans," known in Brazil as cumaru (*Dipteryx odorata*), by crushing handfuls of them with grasshoppers. The *Tupí-Cawahíb* add tocari (Brazil nut, *Bertholletia excelsa*) to maize when preparing maize beer (Lévi-Strauss, ms.).

There are other condiments of animal or mineral origin.

POISONS

The composition of curare has been the object of many discussions. Sampaio (1916) lists the following plants which are used in the preparation of the curare of the *Nambicuara* and *Paressí: Strychnos, Lisianthus virgatus, Cassia rugosa, Dioscorea* sp., and species of Apocynaceae, Marcgraviaceae, and Sapindaceae. Vellard (1939), however, has proved that the *Nambicuara* curare consists only of the extract of a plant of the genus *Strychnos.* There is no doubt that this and other species of *Strychnos* (*S. medeola, S. toxifera, S. cogens, S. crevauxi*) provide the active element in the preparation of the more elaborate poison of the Amazon Basin.

Dance, quoted by W. E. Roth (1924, p. 151), makes mention of two other arrow poisons: the heauru-canali and the hurubuh, similar to the hog tannia.

"Bresillet" or carasco (guao of the *Taino*) was perhaps used as an arrow poison, and Oviedo mentions it as a cosmetic for whitening the skin (Roumain, 1942, p. 29). It is doubtful if the poisonous manceniller (*Hippomane mancinella*) was ever used for arrow poison. A poisonous bamboo used in the Guianas as an arrow point is said to be *Guadua latifolia* (Roth, W. E., 1924, p. 151); Roth quotes Barrère that arrows were poisoned in Cayenne with the milk of the pougouly tree (*Ficus venenata*) and with several other ingredients.

Among other poisons were *Thevetia ahouai* (eastern Brazil), *T. peruviana* (northern Brazil and West Indies), and *T. bicornuta* (Mato Grosso), commonly known in Brazil as "Chapeu de Napoleão," which Thevet (1878) stated were used for revenge in love affairs. The *Nambicuara* used the rosin of certain Bombacaceae as a magical poison, and there are many other unidentified native poisons, such as pakurú-neará, a cardiac poison of the *Chocó* mentioned but not identified by Nordenskiöld (1930) and studied by Santesson (1929). In Surinam there was an especially poisonous arum called punkin, *Arum venenatum surinamense* (Roth, W. E., 1924, p. 564). Most poisons are kept secret by the natives.

Several wild grasses are known as poisonous to animals.

The so-called fishing poisons include a large number of plants the physiological action of which is not at all identical. Some are true poisons, some act only by suffocating the fish.

Hoehne (1937, pp. 98–99) lists for Brazil three groups of fish poisons: guarana timbo (*Dahlstedtia pinnata*); many species of *Tephrosia*, in particular *Tephrosia toxicaria;* and the group of the "timbo do cerrado" comprising *Magonia pubescens*, *Indigofera lespedezoides*, and a species of Sapindaceae.

The *Tephrosia* species are known under the name of tingui in most parts of Brazil and as yarro-conalli by the *Macushí.* The barbasco of eastern Bolivia and the upper Amazon is *Serjania perulacea.* In Perú the name barbasco is also given to *Tephrosia toxicaria.* The ochoho of eastern Bolivia is *Hura crepitans.*

In the Guianas, the following fish poisons were identified: *Tephrosia*, haiari, heri, nako (kumu or cube of Perú) (*Lonchocarpus nicou*, *L. densiflorus*, *L. rufescens*), quanami, gonami, kunalli, etc. (*Clibadium asperum*, *C. surinamense*). On the Demerara, cumapuru (*Phyllanthus conami*) leaves are bruised with leaves of kunami, a shrub, and the dried light pericarp of the arisauru (*Derris pterocarpas*), which give buoyancy to the mass, and cast into the river along with pellets of dough to tempt the fish and to paralyze and kill them (Roth, W. E., 1924, pp. 203–204); haiara-balli (*Muellera frutescans*) is an *Arawak* poison. According to Gumilla, alligators were shot with arrows made of poison bamboo (Roth, W. E., 1924, pp. 202–207).

There are several antidotes for poison, among them a decoction of *Potalia amara* leaves for cassava poisoning, the only one identified by W. E. Roth (1924, p. 711). (See Medicines, below.)

MEDICINES

Early travelers were surprised at the number of herbs known to the Indians and by the fact that the natives always used "simple" remedies, each employing only one plant at a time, whereas Europeans relied more on semimagical combinations of several herbs.

Few primitive people have acquired as complete a knowledge of the physical and chemical properties of their botanical environment as the South American Indian. With the exception perhaps of the cinchona bark (*Cinchona* sp., several Rubiaceae, especially "cascarilla" of the Spaniards, *Cinchona pubescens*), there is no species used in modern pharmacopoeia which was not familiar to the natives in pre-Columbian days. Furthermore, it is probable that only a fraction of the herbs used by modern Indians are presently known and exploited. The following list is only partial and fragmentary, and it is limited to the species mentioned most frequently in the literature.

For most internal disorders, the natives administer an emetic followed by a purgative. The principal emetic is the root of the ipeca or poaia (*Cephaelis ipecacuanha*), but in certain regions of the Guianas, the Indians use the bark of the wallaba tree (*Eperua* sp.), a small creeper (*Vandellia* sp.) and tobacco juice (Roth, W. E., 1924, p. 704). Other emetics known to the Indians in central Brazil are *Cissampelos glaberrima*, *Manettia ignita*, the kaamarã' tai (*Asclepias curassavica*), and kaa' chsa (*Chiococca anguifuga*).

A great many purgatives are known to the Indians: several Cayaponia (tayuya of the *Tupí*); cassia (taracu, *Cassia occidentalis*); several kinds of nuts, such as anda-uassu (*Johannesia princeps*) and "pinhão do Uruguay" (*Jatropha curcas*); jeticucu or "batata da purga" (*Operculina convolvulus*); several species of *Ipomoea*; sarsaparilla (*Herreria salsaparilha*) and its numerous substitutes (*Smilax aspera*). Against worms the Indians use gameleira branca, the latex of *Ficus anthelmintica* or *F. glabrata*, *F. dolaria* and of some other Moraceae, the seeds of Andira, etc.

For gastric disturbances, the Brazilian Indians take paico (*Chenopodium*) and *Dryopteris*; the Guiana Indians, *Jatropha gossypifolium*, *Boerhaavia hirsuta*, *Chelonanthus alatus*, *Allamanda aubletii*; and the marginal Indians of the Tropical Forest area, yerba del moro (*Amaranthus* sp.) or urutu (*Alternathera repens*).

For healing wounds, the Brazilian Indians used besides balsams (q. v.) the crushed seeds of *Mucuna altissima*, tupixaba (*Scoparia dulcis*), hiboucouhu (*Virola* sp.), crushed seeds of the toxic fruits of *Carapa guianensis*, pounded and parched leaves of *Piper jaborandi*, and *Pilocarpus pennatifolius*.

Astringent herbs of native pharmacopoeia are camara (*Lantana camara*), *Polypodium crassifolium*, *Oxalis tuberosa*, and *O. angustiolium*.

To stop bleeding, the Indians used *Arenaria lanuginosa*, *Oenothera rosea*, *Chrysophyllum glycyphloeum*, and some mushrooms (*Polyporus coccineus* and *Geaster saccatus*).

Among the drugs used to cure eye pains, a constant complaint of South American Indians, Roth mentions red-pepper juice, the leaves of mokumoku (*Caladium arborescens*), a decoction of Wansimai roots, and the purplish red juice of kuruwatii (*Renealmia exaltata*). A plant "similar to a palm tree" (*Jatropha urens*, according to Hoehne) serves the same purpose.

Febrifuges include decoctions of the barks of *Diospyros paralea*, *Scoparia dulcis*, *Lisianthus purpurascens*, *Tachia guianensis*, *Strychnos pseudo-quina*, *Cassia amara*, amapaima or casca preciosa (*Cryptocarya pretiosa*), *Uvaria febrifuga*, and *Nectandra rodiaei*, and infusions of *Eryngium foetidum*, *Byrsonima crassifolia*, and guarana (*Paullinia sorbilis*). Other febrifuges listed in the literature are: quina (*Hortia brasiliana*), quinaquina (*Myroxylon* sp.), "quina do matto" (*Esen-*

beckia febrifuga), taperihuá (*Cassia* sp.), coroba (*Jacaranda oxyphylla*), caapeva (*Pothomorphe sidaefolia*), caapomonga (*Plumbago scandens*), and camara (*Lantana* sp.).

Against diarrhea and dysentery, the Indians made infusions of the bark of *Byrsonima crassifolia*, *Ambelania acida*, *Jatropha curcas*, *Stachytarpheta jamaicensis*, *Cephelis ipecachuanha*, and *Acrodiclidum camara* or *Akawai* nutmeg, and of the seeds of greenheart (*Nectandra*); also of the sap of the wild nutmeg as a mouth wash and a cure for "yaws" (Roth, W. E., 1924, p. 709).

Antidotes used in Guiana for snake and spider bites, sting-ray wounds, and poisonous arrows are: *Dracontium dubium*, *Byrsonima crassifolia*, *Rhizophora magle*, and *Potalia amara* (Roth, W. E., 1924, pp. 710–711). The *Yahapé* used *Kyllinga odorata* and *caapia* (*Dorstenia* sp.).

Sedatives known in Brazil include guaxima (*Urena lobata*) and ubirataya or ibirarta-iba (*Pilocarpus pennatifolius*). Abutua (*Chondrodendron platyphyllum*) and *Verbena erinoides* are appetizers. To cure venereal diseases, the Indians used the bark of hyvourahi (*Pradosia glyciphloea*, according to Hoehne) and several species of Bignoniaceae.

Other special plant uses are: Aphrodisiacs (*Justicia pectoralis* and *Jatropha* sp.), contraceptive (*Stenomesson variegatum*), cure of toothache (mohomoho or jaborandiba, *Piper* spp.), hernia remedy (samambaia, *Pteridium aquilinum*), and cure of pulmonary afflictions (*Gnaphalium spicatum*), blisters (*Ranunculus pilosus*), scurvy (*Nasturtium pumilum* and *N. officinale*), hemorrhoids (*Tillandisa usneoides*), and catarrh (*Mirabilis peruviana*).

Several species of *Datura* and *Thevetia* are used for their anesthetic properties.

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CULTIVATED PLANTS OF SOUTH AND CENTRAL AMERICA

By Carl O. Sauer

INTRODUCTION

One of the most important, most difficult, and least-known classes of culture traits is the body of plants taken under native cultivation. The following sections attempt a review of some of these plants as living artifacts which give evidence of culture origins and diffusions independently of, and sometimes contradictory to, the conventional records of archeology, linguistics, and ethnography. The evidence at hand is shockingly fragmentary, considering the importance of the material to an understanding of culture history, and the conclusions here offered are to be considered rather as queries than assertions. The evidence considered has been of the following kinds:

(1) Observations that were made before a significant displacement of crop plants took place through European influence. Not only are the Spanish chronicles, and to a lesser extent those of the Portuguese and French, remarkable in the sharpness and detail of such observations, but for all Spanish colonies the Relaciones geográficas of the end of the 16th century made formal and systematic inquiry as to native and introduced field crops and fruit trees (Jiménez de la Espada collected four volumes of these for South America and provided masterly notes, 1881–97). In addition, there are the priceless natural histories for Spanish America of Oviedo y Valdés, the first version of which was completed in 1525, the last in 1548; of Soares de Souza for Brazil in 1587, and of the Jesuits, Acosta in 1590 and Cobo in 1596–1653. These give an approximately continuous series of competent observations from 1514, the year when Oviedo first came to Darién, to 1653, when Father Cobo ended his long activity of noting New World agriculture. Perhaps no other part of the world has an equal wealth of such data for that time. (In bibliographic references to these works, the date of the modern edition will be used.)

(2) Archeological materials, mostly limited to the desert Coast of Perú and Chile. Not only were organic remains preserved here by reason of aridity, but the cultures of Nasca, Moche, and Chimu utilized plant motifs for decoration or reproduced them plastically with fidelity and frequency. These have been briefly examined by

the writer in the west Coast museums, and even more cursorily in the field. The excellent study by Yacovleff and Herrera, "El Mundo Vegetal de los Antiguos Peruanos" (1934–35), is one of the foundation stones of the present paper.

(3) Regional studies of native cultivated plants and agriculture: Richard Latcham for Chile and adjacent lands (1936 b), F. C. Hoehne for Brazil (1937), Lorenzo Parodi for Argentina (1935), Fortunato Herrera for Perú (1921, 1934, 1942), and A. E. Nordenskiöld for South America in general.

(4) Systematic botanical studies that have regarded the historical agency of man as a distributing and modifying agent: W. E. Safford, (1917 a, 1917 b, 1925), O. F. Cook (1901, 1910, 1925), Wilson Popenoe, (1921, 1924), Oakes Ames (1939), Paul Standley (1920–26, 1928, 1937–38), and Fortunato Herrera (1921, 1934, 1942) being especially noteworthy for their awareness of the role of man in plant distributions and modifications.

(5) Genetic studies, which are increasingly throwing light on cultural processes and contacts. Maize, cotton, and tobacco are already sufficiently known as to hereditary composition and geographic distribution so that important conclusions may be drawn as to their origin and spread. The forms that have been established through selection by the primitive cultivators are actually culture traits, with the peculiar advantage that they continue to exist long after the aboriginal population has disappeared. They may also reveal cultural origins and movements far antecedent to the usual data of archeology. The attempt has been made, therefore, to evaluate not only the gross distribution of species, but to use the results of genetic studies where these are sufficiently advanced to give an insight into the diversification of a cultivated species.

The evidence presented in this paper is weakest for eastern South America, especially for Brazil. Less advanced native agricultures, early fading of native populations, the limited number of botanical observations focused on the differences between cultivated and wild plants, and unfamiliarity on the part of the author with this part of Latin America are the reasons for the gaps in treatment.

Cultivated plants may be classed under four groups, though the knowledge is inadequate at present thus to allocate many, if not most, of the plants under cultivation: (1) The unmodified wild species which is planted for convenience of harvesting or for increase of producing units, or which may be allowed to increase by protecting a wild stand. The number of such plants is almost indefinitely large, especially among woody species. Here man serves only to enlarge the local population of the given species or to extend its range by carrying it to settlements and clearings where it did not grow originally. (2)

Domestication takes place when, in addition to the care and planting of the wild species, local improved races are created. These may replace the unmodified wild form in certain areas, but not in others. Here man definitely appears as an agent of selection. (3) Full domestication is achieved when the wild form, though still existent, is discarded for purposes of cultivation, and only improved mutants or hybrids are grown. (4) Finally, there are the cultigens of which the wild ancestors are lost, and which in most cases depend on the care of man for their continued existence. In numerous cases these have lost the capacity to produce seeds or are otherwise unable to maintain themselves.

We are only at the beginning of the study of the cultivation of plants. Those grown by man have been much less well recorded than the wild flora. Field botanists tend to pass them by, unless they are suspected of being wild; students of native peoples too rarely have known enough about plants, their tillage, and use to identify or collect the material needed. The question as to whether a plant occurs wild or as an escape from cultivation is in very many cases unanswered and may be answered only by a painstaking comparison of the cultivated with the wild-growing form and its locale. Valid cultural historical data can be secured only by gradually building up records of the variations within each kind of plant and their geographic distributions. In the main, the definitive labeling of the relationship of one form to another will have to be done by genetic study, as is now being done for maize and cotton. A hundred field observations and collections are needed where we now have one, and these need to be communicated to plant specialists and then reinterpreted in terms of culture history. For error in the following pages no apology is offered if they stimulate observation of the basic cultural process of modifying native plant materials to suit economic needs and preferences.

MAIZE

Maize, the great food staple of the American Indian, was grown to the farthest limits of New World agriculture, with the exception of the excessively cold Highlands of the Andes. Its range in latitude was from the lower St. Lawrence and upper Missouri Rivers southward to the Island of Chiloé. The latter area demanded perhaps even a greater adaptive selection than did the high northern latitudes, for the summers of Chiloé are not only short, but extremely cool with few, brief, and uncertain stretches of sunny weather.[1]

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[1] Latcham, who knew the southern part of Chile well a half century ago, thinks that the maize grown there was the old form known as curahua in *Araucanian*, a round-seeded pop or flint corn of reduced size of plant and ear and of precocious growth, maturing in about 4 months (1936 b, pp. 136–137). He seems to have overlooked the implication of a quotation he uses elsewhere from Cartés Hogea relating to Chiloé in 1558. This first visitor to the island spoke of a large supply of big (*crecido*) maize and of large ears.

The famous "sacred corn of the Incas," grown in sheltered sun-warmed slopes above Lake Titicaca, marks the highest limits of the grain (about 3,900 m. or 12,700 feet). It is grown there not only on the islands, but in terraces above Puno. The Titicaca maize has been at times referred to as though, for ritual and traditional reasons, it was grown here at altitudes far above those attained elsewhere. Maize is a crop of importance, however, in the upper Vilcanota Valley well above Sicuani (3,574 m. or 11,615 feet). Farther down valley, Cuzco is in the heart of a region of flourishing and diverse cultivation of both maize and potatoes. Indeed, almost the whole length of the Vilcanota-Urubamba depression is brimming with many kinds of maize, from the edge of the puna to the tropical lowlands.

The Andean valleys of south Perú, of Bolivia, and of North Chile (Highlands of Tarapacá and the upper Loa Valley) mature maize at considerably higher altitudes than is possible in more equatorial regions. In these margins of the tropical zone, longer summer days and greater summer warmth are found than in the equatorial Highlands. Near the Equator, where there is no summer season, maize culture hardly reaches 3,000 m. (9,750 feet), as about Quito. Bogotá, at 2,660 m. (8,645 feet), is near the upper limit for central Colombia. In Ecuador and Colombia the inflow of cloud-forming air from the tropical lowlands also depresses the day temperatures. In contrast to the south, in the northern Andes are grown types of corn that take nearly the entire year to mature. Here there are also extremely dwarfed types, growing only knee high. Seeds of such types, brought from the Quito area and planted at Pasadena, however grew to plants of normal height.

Although maize is but a single botanical species, and one that normally is cross-fertilized, yet geographical separation, differences in time of flowering, and preferences of the native cultivators have formed in time and preserved to the present an extraordinary variety of forms, hardly equaled among cultivated plants. The tracing of kinship and diversity in this wealth of forms promises much new light on the history of man and of agriculture. Maize has been the subject of a vast amount of study by geneticists, and is the best-known plant as to its genetic constitution. At the moment, these studies are in full course of being directed to the analysis of its origin and diversification. Especially Paul Mangelsdorf, Edgar Anderson, and associates are making notable contributions thereby to genetics and anthropology (Mangelsdorf and Reeves, 1939; Mangelsdorf and Cameron, 1942; Anderson and Cutler, 1942). Any future consideration of maize as relating to Indian culture must be based on a knowledge of these remarkable investigations, too comprehensive to be summarized here, but basic to the remarks that follow. They are supplemented by personal observations in the Andes, the South American west coast, and México. These remarks, it is hoped, may invite a study of the relevant genetic literature.

There is sadly little in most written accounts of maize that helps to recognize the particular kind under consideration. The older historical records rarely noted more than the color of the grain, or occasionally the time it took to mature and some items on its utility in food and drink. Field botanists were little interested, since it was a cultivated plant. Ethnologists have had small curiosity about the plant and its habits, and not a great deal about its uses in the kitchen. The simple things we need to know about Indian corns in all parts of the New World for the most part remain to be gathered: the habit of growth of stalk, leaf morphology, the nature of tassel and ear with its husks and silk, plant color, tillering, shape of the cob, arrangement of the seeds, and their shapes. Less significant are the items most commonly noted, i. e., the color of the seed and the nature of its endosperm (excepting in popcorns).

The work of Mangelsdorf showing that *Teosinte* (*Euchlena*) is not an ancestor of maize but a hybrid between maize and a species of *Tripsacum*, has clarified the problem of origin and classification. It has removed the strongest argument for considering Central America as the place of origin for maize. Perhaps even more significantly, it has laid the basis for distinguishing between "pure" maize and the forms that have *Tripsacum* admixture in varying amount. This is interpreted as due to a backcrossing into maize from *Teosinte*, and hence the "secondary" maize varieties may have been developed in Guatemala (and central México?). Cytologically, a fundamental distinction is made between the pure maize with knobless chromosomes and the *Tripsacum* admixed forms that have knobby chromosomes. Morphologic differences further distinguished the *Tripsacum*-free maizes from the tripsacoid ones.

The nontripsacoid maizes are considered as the older group, and they seem to occur especially (though not generally) at the outer peripheries of corn cultivation, in highland situations, especially with cultural isolation, and widely in South America, but much less so in North America. Tripsacoid qualities, in so far as known, are strongly present in tropical maizes, supporting that cultivation spread from temperate climates into hot ones.

The "pure" maize probably involves the following characteristics: Knobby joints and a somewhat zigzag stalk, hairy leaf sheaths and stiffish leaves, purplish color in all or several parts of the plant, coarse root system, ears of pyramidal shape (markedly tapering and having a heavy butt), soft, brittle cobs and long glumes, irregularly rowed seeds, and erect tassels. A tripsacoid maize by contrast is likely to exhibit slender, canelike growth, elastic and little subject to breaking or lodging, often of bright green color; cylindrical ears; dense woody cobs and short glumes; seeds in straight rows; widely branching tassels; and free tillering.

According to Mangelsdorf and Cameron (1942, pp. 237–238), the pure South American maize spread to Guatemala and hybridized with *Tripsacum* growing about the maize fields. By repeated backcrossing, *Teosinte* was formed, and from it new forms of maize arose by further crossing. They state:

> New varieties came into existence in which the seeds were smaller, more inclined to be indented, more uniform in size and shape and arranged in straight rows on the rachis. The cobs became firmer and less susceptible to shattering, the stalks became tough and resistant to lodging, the leaf-sheaths became glabrous instead of pubescent and the plants became resistant to smut. These new tripsacoid varieties were much superior to the pure maize at lower altitudes, and rapidly replaced it, if indeed it was ever extensively grown there.

These new forms then spread both north and south, especially at low altitudes, and extended the range far beyond that of the "original" Andean kinds.

Dent corns are a highly complex group needing much additional collecting and study. Some are secondary hybrids of maize and *Teosinte.* Denting (a depression in the mature kernel) is based on the inheritance of a number of genes. The Russian geneticists established the greatest diversity of this type as located in México. There is a strong correspondence between the major area of denting and that of the preparation of hominy by soaking in lime or wood ash (nixtamal in México). Mangelsdorf and Reeves (1939) point out the rarity of dent corn in the Andean area, though it must be noted that denting is quite common in prehistoric corn of the Coastal desert of Perú (as in the large finds at Paracas). The implication is that the immigration from a secondary center (from Guatemala?) took place at a rather remote time.

The tropical flint corns are another group showing *Tripsacum* introgression. They dominate the shores of the Caribbean, and may have been almost the only maize of the West Indies. Vavilov and Kulashev consider that this was the parent of the maize introduced into Spain and now grown all about the Mediterranean. In the tropical valleys of Colombia it is very tall, with thin but very elastic stalks, bright green color, loose tassels, and produces long, cylindrical ears, with rather large, flinty, honey-yellow kernels. A similar corn was probably before the eyes of Oviedo y Valdés when he wrote (1851–55, bk. 7, ch. 1) of a stalk like a lance, more or less the thickness of the thumb, growing much taller than a man and with leaves greener than that of sugarcane. The flintiness of these types makes them especially weevil resistant, and hence most suitable for storage in hot climates. To what extent the flinty corns of the Andean lands (morocho) are of the secondary types remains to be investigated. It is probable that they include both pre- and post-*Tripsacum* forms.

We know that numerous kinds of flour corn (capia, in Quechua), popcorn, and sweet corn are of very wide aboriginal distribution and undoubtedly were often selected at different places and times for cultivation. They have as yet little diagnostic value. Some of the popcorns, however, are old, as shown by their archeological frequency in Perú and Chile. Edgar Anderson, in studies under way, is finding that certain forms of popcorn are genetically primitive.

Mangelsdorf has revived the hypothesis that the most primitive corn is pod or tunicate. He further suggests that this may have existed wild and, indeed, that it may perhaps still be discovered growing wild, perhaps in the Paraná-Paraguay Basins. He cites five references to its cultivation by the *Guaraní* Indians, the name "pisingallo" there being given to it, and its general suitability to the climate of that area with long, warm, and rainy summers, and a following dry season.

A pod-corn-like ancestor may well have existed. There are many cobs and ears in the desert archeological sites of both Perú and Chile showing excessively large, long glumes, also soft, brittle, extremely thin, and perhaps hollow cobs, and sharply up-curved pointed seeds. This hawk's-bill type of seed is still common in the Highland corns, as about Quito and Cuzco.

The location of the cradle of maize in the *Guaraní* land appears unwarranted. Its position is quite peripheral to agriculture as a whole and to the distribution of advanced culture traits and complexes. There are many areas as suitable ecologically. The distribution of pod corn in cultivated maize is very wide, and extended to North American Indians, as Mangelsdorf points out. The term "pisingallo" is probably *Quechua* and is known at least as far as Antioquia in Colombia.

It seems more reasonable, therefore, to consider that maize originated sufficiently far away from the Equator to have a well-marked contrast between a warm, rainy summer, and a dry, cool fall (but no cold winter). Northward, it is difficult to locate an area suitable as to climate and soil much short of Guatemala. Southward, however, such a condition exists, especially south of lat. 10° S. in the large eastern valleys of the Andes of Perú, such as the Urubamba. In this valley, incidentally, maize growing is not restricted to irrigation, as Mangelsdorf appears to think. There are sections of secure and sufficient rainfall, and the flood plains generally have sufficient flooding and subirrigation.

Present evidence points to a dissemination in all directions of the early forms from an unknown center, and especially their successful specialization in the upper parts of the temperate and the lower part of the cold zones. In the northward migration a new group of forms developed in Guatemala, México, and the North American Southwest, especially by backcrosses with *Teosinte* (*Euchlena*). These new forms, especially the tropical flint corns, but also dent forms, were then distributed southward as well as northward. The former supplied an admirable grain suited to moist tropical lowlands. They penetrated the West Indies, but apparently did not pass to the adjacent mainland of the United States. They also became the chief grain of Brazil, it would appear. The other tripsacoid corn distributions are not sufficiently well known for South America to make any conclusion at present.[2]

The original home of maize is a greater puzzle at present, with genetic studies continually enlarging the phylogenetic picture, than ever before. It was probably not tropical, nor did it come from land deficient in rain, but we cannot say that it began in the northern or the southern hemisphere nor can it even be attributed with certainty to the New World as long as certain matters concerning Southeastern Asia remain unsolved. It is likely, however, that the origin of maize will be discovered in a fairly near future.

As to the uses of maize, we have also only fragments of information. The Spanish annalists give the impression that more of it was drunk and less eaten in the West Indian-South American area than in the Mexican-Central American area. "Chicha" is an island *Arawak* word. The first Spanish visitors, such as Cieza de León, were impressed by the drinking powers of the Indians in Colombia. The records on chicha in the *Inca*-dominated lands are numerous and well known. In general, flint corns appear to have been most used. The distribution of sprouting and roasting, of chewing the grain, and of the fermentation of (roasted and unroasted ?) meal needs further study, as does the occurrence of wine from green cornstalks. Parching entire ripe grain and popping are also much more emphatically South American than Middle American. It would seem also that the boiling and roasting of ears in the milk stage consumed a larger share of the crop in South American practice than of that to the north. Certainly today corn is more a vegetable and less a grain than it is in México. Whether the preparation of hominy by soaking in lye or lime water, and its subsequent grinding while moist, were known aboriginally in South America is still doubtful. It seems that maize was nowhere, south of Honduras, the staple foodstuff that it was further north.

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[2] Unpublished work by Hugh Cutler has shown the wide occurrence of a species of *Tripsacum* along the eastern base of the Andes. It is possible, therefore, that the earliest tripsacoid traits were acquired in South America and that additions took place when corn was mingled with the *Tripsacum* of Guatemala.

LESSER SEED CROPS

Grasses, other than maize, were cultivated in the New World only, insofar as known, in Chile and in the Sonoran region: (1) A domestic cereal grass has been collected lately among the *Varohio* tribe of northwest México and identified as *Panicum sonorum* (Gentry, 1942, p. 64). (2) Teca is a lost winter cereal of Chile, well documented in early accounts and there called a form of small barley or oats, but not known to have survived to the latter part of the 18th century (Latcham, 1936 b, pp. 161–163). It was roasted, ground, and mixed with water as a drink (ulpo) (Lenz, 1904–10, 2: 714, 758), similar to the pinole of the Mexicans. (3) Somewhat better known is the Chilean mango, which was found by Gay in 1837 still grown in Chilóe, and identified by him as *Bromus mango* (Gay, 1854). His type specimens have been preserved, and there are rumors that the plant is not extinct. It was a biennial; and it also was drunk as ulpo, used somewhat for making chicha, and was baked in pones. Latcham (1936 b, pp. 159–161) calls attention to the fact that it was not mentioned by the early chroniclers, who, with one exception, however, did not know the Indians of South Chile (such as *Chilote*).

Chile also is the home of madi (*Madia sativa*), a species of Compositae grown for its oily seeds. A wild form is known in California as tarweed. This plant was cultivated from Central Chile south to Chilóe Its seeds were ground, cooked, and mixed with other meal. It is a fairly good source of edible oil, though there is no evidence that the Indians pressed the oil and used it separately. The Mexican chia (*Salvia hispanica*, though not a native of Spain) is still an Indian crop grown well southward into Central America. Its gelatinous seeds are valued as food for infants and the infirm.

Chile holds a singular position in the cultivation of seed crops. In addition to maize its aborigines grew quinoa (see below), mango, teca, and madi, the last three peculiar to that country. The inference is that these are ancient crops native to that land and that they preceded the cultivation of the more productive maize and quinoa. Chile has a rainfall regime opposite to that of the rest of South America, with the dry season in summer. Its endemic crops were planted in the cool and rainy season (spring, or even winter) and matured in summer. Later, we may imagine, they were gradually replaced by quinoa and maize, both introduced from Perú. The adjustment was not difficult in the case of quinoa, which is grown on the Andean Highlands at minimal vegetative temperatures and met similar conditions in Coastal Chile. In the case of maize, however, the passage from the irrigated, warm summer lands of the north to nonirrigated cultivation in the cool south undoubtedly required long selection.

The goosefoot and amaranth families have yielded a number of cultivated plants, grown mostly for their seed but also used as greens. They served in Indian cooking, and still do in part, as substitutes for spinach. The most important is the Andean quinoa or quinua (*Chenopodium quinoa*), replacing maize in the higher mountains; it was formerly cultivated from the *Chibcha* Highlands of Colombia to the southernmost limit of agriculture in Argentina[3] and on the Pacific Coast as far as Chilóe. It may be noted that in higher latitudes quinoa became adapted to the contrasted climates of central Argentina (= mid-Texas) and Chilóe (= Oregon coast). It has now retreated from the extremities of its earlier range, but is still a characteristic food plant of the *Inca*-dominated Highlands. Quinoa is definitely a cultigen, with no close wild relative. Possibly it is the same plant as the nearly lost *Chenopodium nuttallii* of the Valley of México.

Quinoa is a remarkably useful plant to the Highland Indians. It needs little warmth for its growth, tolerates some frost, and yields far more than any other grain in the Highlands. A gross feeder on nitrogen, it is often planted in old enclosures used by llamas and sheep. A number of varieties are distinguished, largely by color of plant and seed. A large-growing, whitish-seeded form may be a long-established selection from the general polymorphous stock. Fields of quinoa give the only note of bright color to the puna landscape, their color range nearly duplicating the autumn display of hardwoods in the United States.

The seeds are bitter and require repeated washing. In addition to being used as boiled grain and ground as meal, they are fermented in making chicha. Ashes of the stalks are kneaded into pellets to be chewed with coca beans. Archeological occurrences have been noted by Safford (1917 b), Yacovleff and Herrera (1934–35, 3: 306–307), and for Chile by Latcham (1936 b, p. 155).

Cañihua, or cañahua, has been recognized as a species (*Chenopodium pallidicaule*) (in 1929 by Aellen). The old chroniclers usually named it as a form of quinoa or as grown with the latter; Cobo (1893) for instance, called it an "ashy-colored quinoa producing an especially potent chicha," neither of which qualities seems to be especially pertinent to the plant. Cañihua is a much less vigorous plant than quinoa, commonly growing only to a height of 1 to 2 feet; its seed panicles are looser and smaller. It is especially used as a roasted meal, is usually stirred in cold water, and, like the Mexican pinole, is a mainstay of Indians in their travels. The plant is less exacting of fertile soil, I should judge, than quinoa and even more resistant to cold. It is common on the high puna of Bolivia and in the coldest parts of southern Perú. There is a good summary of it by César Vargas, 1938.

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[3] There is an account of the Indians of Cordoba cultivating quinoa (Jiménez de la Espada, 1881–97, 2: 151).

Colonial records from north México into Northwest Argentina make brief note of the cultivation of amaranth, most commonly designated as "bledo." The classical study is still Safford's "Forgotten Cereal of Ancient America" (1917 b), which contains most of what is known to this day. In central México the Spaniards discouraged its growth because of the ritual use of the meal in pagan ceremonies, but it is by no means an uncommon Indian crop today, and the cakes of huautli or tzoal are still seen in markets of many towns and villages now celebrating Catholic feast days. It is one of the major crops of the hill *Mayo* in southern Sonora, and probably survives in Indian cropping throughout the hot summer lands of México and Central America. In the Andes, Fortunato Herrera (1942) has identified it particularly with the *Huanca* people, and as grown in the barrancas of Huancavelica, Junín, Ayacucho, and Apurimac, below the levels of quinoa cultivation. It has a number of Indian names in Perú, perhaps the commonest being "quihuicha."

The botanical position of the cultivated amaranth is still uncertain (Ames, 1939). There are a number of varieties, more or less intergrading, but whether these are distinct species is undetermined (such as *caudatus*, *paniculatus*, *hybridus*, etc.). They are of ancient, possibly very ancient, culture in México and the Andes, but also in India and other Asiatic monsoon lands; in each case they are deeply embedded in native ways and bear old local names, and serve as cereal and potherb among conservative and remote people. Ames points out that the relationship of the crop amaranth remains to be determined for both sides of the Pacific as part of the question of early trans-Pacific cultural connections.

The possible role of amaranth in the beginnings of agriculture was considered by Safford. Gilmore (1931) has shown since that an amaranth was cultivated in the Mississippi Valley along with other weedy plants, before maize and beans were known there. The cultivated amaranths and chenopodiums are improved relatives of the common pigweeds of barnyards and fields. They establish themselves with ease on flood lands, rich in organic matter, wherever nature or man provides an open sunlit space. The first attempts at growing crops by primitive man are likely to have been on precisely such sites. It seems likely however, that these first trials at cultivation would have been made with some other plant, such as an edible root, more inviting to culture than a small-seeded, weedy annual. In such case the pigweeds would be thought of as entering the primordial floodplain clearing as volunteers, perhaps tolerated for their abundant seeds. Yet the Mississippi Valley primitive horizons disclose no such crop, but only the seeds of "weeds," judged from their augmented size to have been selected and planted. Safford's surmise of the high age of amaranth cultivation may be correct therefore. The cultivated amaranth was developed not so much in the direction of great increase in seed size as of the forming of large panicled heads, carrying a great number of seeds. An individual crop amaranth plant is probably not inferior in the weight of seed produced to a plant of maize, and a field of amaranth in Indian cultivation is likely to outyield one of maize. Both amaranth and quinoa are efficient economic mechanisms. Their failure to pass into the White man's agriculture is apparently due to a disdain that attaches to them as food for Indians, as in Perú and Bolivia, where public and private effort is directed to the expansion of wheat and barley.

BEANS

Legumes were cultivated for edible seeds in every agricultural area of the New World. The American domesticated plants include four species of the common bean (*Phaseolus*), perhaps one jackbean (*Canavalia*), the peanut (*Arachis*), and a lupine (*Lupinus*).

The lupine (*Lupinus*— species undetermined; Fortunato Herrera first called it *tauris*, but later changed it to *mutabilis*) is restricted to the high Andes from Ecuador to Bolivia, above the altitudes at which the kidney bean can be grown. It is known in *Quechua* as "tarhui," in Spanish as "chocho" or "altramuz." This handsome plant is usually interplanted with the dwarf Andean maize and grows to about the same height. The very large white seeds are extremely bitter and reputedly also poisonous (alkaloid?). They require repeated soaking for a number of days to become palatable. It is apparently a cultigen developed from a local wild lupine as a cold land substitute for the kidney bean. With its large seeds and its tolerance of low temperature and poor soils it would be a valuable crop plant had selection succeeded in getting rid of the bitterness of the seed. Archeologically it is known from Tiahuanaco designs (Yacovleff and Herrera, 1934–35, 3:305–306). In modern times it has been replaced in large measure by the Old World broadbean (*Vicia faba*) and field pea (*Pisum arvense*) which grow well in the higher levels of Andean agriculture.

The peanut (*Arachis hypogaea*) is one of the few domesticated plants attributed to Brazil, the nearest wild relative being found from Bahia to Rio de Janeiro (Bukasov, 1930, pp. 177–179, after Chevalier). Indians in Mato Grosso and Santa Catarina have cultivated somewhat divergent forms, which however are referred by Chevalier in his monographic treatment to the species *hypogaea*. The peanut grown by the *Nambicuara* of the Plateau of Parecís in Mato Grosso retains the perennial habit, and may therefore be the most primitive form in cultivation. If the *Nambicuara*, situated between *Arawak* tribes on the west and *Tupí* southeastward, are the keepers of one primitive cultigen, their study may yield further light on the origins of Brazilian agriculture. The peanut was generally important in *Tupí* economy. Soares de Souza gives a good early account of the plant and its use in the Bahia area, stating that its culture was reserved to the women. The peanut also was grown, it seems, throughout *Arawak* territory into the Antilles, whence the name "maní" under which it is commonly known in Spanish America.

It was also well established in the warm valleys flanking the Central Andes on both sides, and therefore a familiar product by trade in the Highlands. Large quantities of it are found in the tombs of Coastal Perú. They indicate therefore a cultural connection between eastern Brazil and Coastal Perú of considerable antiquity. Ames (1939, pp. 47–48) has pointed out the resemblance of the Peruvian archeological forms to the kind of peanut grown in the Orient and suggests the need of comparative morphologic-genetic studies. (See also Bois, 1927–28, 1: 94–96, who recognizes after Dubard a Brazilian and a Peruvian subspecies, the latter the cultivated form in the Orient.) The assumption that it was introduced into the Malayan, Indo-Chinese, and south China areas by Whites rests on no specific evidence. Bukasov (1930, p. 178), following Rivet, suspects the possibility of a pre-Columbian trans-Pacific dissemination that reached Africa. In view of its wide and important establishment about the China Sea and Indian Ocean, the weakness of its penetration into continental North America is remarkable. In México it has been only an incidental food item, not appearing for instance on Montezuma's list of tributes. Its Mexican name "Tlalcacahuatl' (ground cacao), suggests late introduction. Nor was it grown north of central México, though soil and climate are suitable. There is a strong suggestion that it belonged in the complex of manioc cultivation (both bitter and sweet) in its New World distribution.

The jackbean (*Canavalia ensiformis*) belongs to a tropical genus, with both American and Old World species. The taxonomy of the cultivated Canavalias remains unsettled. By some they are all placed in one species, by others in two, *ensiformis* usually considered of New World, *gladiata* (swordbean) as of Old World origin. The morphologic distinctions are minor and have not been tested genetically. One of the points of difference usually brought out is that the seed color of the New World jackbean is white, and that of the Old

World brown, pinkish, spotted, etc. However, the graves of Coastal Perú yield numerous lots of colored and spotted jackbeans. (In the Uhle collection at the University of California are two large lots of *Canavalia*, one consistently particolored, dark brown mottled on light brown, and the other a single color, now like old saddle leather.) See also the illustrations and text in Yacovleff and Herrera (1934–35, 3: 290–291), where in addition particolored beans of present cultivation are noted. The bean has also been determined archeologically for the southwestern United States (Whiting, 1939). No notice seems to have been taken of the plant by Spanish chroniclers, nor do I know of the survival of native names. It survives, on a very small scale, in cultivation from México to Perú and Brazil, including the West Indies (Bukasov, 1930, p. 177, in part after Piper). Apparently it is a cultigen, with occasional escapes. Its archeological distribution and relation to wild species indicate the jackbean as a New World domesticate. Future studies may determine whether the Old World forms are derivative from the New World stock. The New World forms have a low repute as a food, but I am not aware that definitely poisonous qualities are ascribed to them. In some of the Old World forms toxic qualities (HCN ?) have been claimed.

Aside from its size the jackbean has little to recommend it as a foodstuff. It is not clear why its domestication should have been undertaken or its culture maintained at the side of the lima and kidney beans, which grow in the same areas. However, very little is known of its role in native economies. May it have been a more ancient tropical domesticate than the other beans, and simply continued to be grown out of conservatism of habit after the better beans were available?

The true beans include four American domesticates: (1) *Phaseolus vulgaris*, the common, kidney, navy, string, or snap bean; (2) *P. lunatus*, the lima bean; (3) *P. multiflorus* (or *coccineus*), the scarlet runner bean; and (4) *P. acutifolius* var. *latifolius*, the tepary bean. For the common bean the name "frijol" (and its variants) is used through most Spanish and Portuguese areas. This name is of Mediterranean origin (cf. the Latin form *Phaseolus*) and was there applied to a similar plant, probably either a *Vigna* or *Dolichos*. With the immediate transfer of an Old World name, Indian names for the like-appearing New World legumes were not taken up by Europeans, except in the *Inca* region where "poroto" became an alternative name for the frijol, and "pallar" for the lima bean. For the latter, haba is a common term in many sections, giving rise to confusion with the real haba (*Vicia faba*).

The tepary bean has the most limited distribution and is probably the latest to be developed at the hands of man. Its major use has been by the *Cáhita* and *Piman* tribes and their neighbors, that is, in the area adjacent to the upper Gulf of California. A minor series of occurrences has been noted lately in the lowlands of Chiapas and Guatemala, and in spots north along the Coast; nothing is known of its presence elsewhere. It would seem therefore to be a domesticate by substitution for the other beans in the very hot, and more or less arid, lands of Sonora and Arizona, because of its heat tolerance, partial tolerance of soil alkalinity, and minimal demands of water. It is fairly old archeologically in the southwestern United States.

The lima bean predominates over the frijol in the majority of the American Tropics. It is a usual crop in the tierra caliente, wherever there is a sufficiently well-marked dry season. In its basic forms it is a tall-growing, climbing perennial, requiring a warm, wet growing season followed by a warm, dry period. Rarely is it found much above 1,200 m. (4,000 feet) above sea level. Truly wild limas have been reported from Guatemala, and the form assemblage of the kinds cultivated there favors this area as the primary center of domestication (Mackie, 1943; Bukasov, 1930; Ditmers, Ivanov, and Popova, 1937).

The genetic architecture of the species is poorly known as yet. Mackie (1943), on the basis of long experience in lima bean breeding, has undertaken the most comprehensive appraisal of its origin and dispersal in these terms. He recognizes three main "branches"—the *Carib*, the *Hopi*, and the *Inca*—all dispersed from the primary center in Guatemala. The first, and probably oldest, of these passes through Yucatán, the Antilles, into Venezuela, and possibly into Brazil, though the Amazonian lands are unfavorable to it. In the *Carib* branch "potato" shapes and bright-red color are common, and many plants produce seeds high in a glucoside that causes cyanide poisoning if cooked in the ordinary manner. The possible connection with this branch of the Konian bean in French Guiana may be suggested (Bois, 1927–28, 1: 153, after Chevalier). A second division is called the *Hopi* branch by Mackie, extending up the Mexican west coast, through the southwestern United States, and into the southeastern part. This small-seeded group is sharply separated from the *Carib* branch by lack of photoperiodicity, flatness, and lack of glucoside. It is apparently a selection for cultivation in areas of warm summers and long days. That this selection was slow is shown by the late and subordinate appearance of the lima bean in archeological records of the southwestern United States, and this despite the apparent antiquity of domestication of the lima bean. The third or *Inca* branch consists of the Peruvian pallar, of maximum size of pod and seed, least primitive in its characteristics. The Peruvian or "*Inca* branch" is the most highly bred, and in it forms were established that were able to penetrate far southward, as in Chile, into latitudes of greatly lengthened summer days. On Brazil the records do not permit a conclusion as to whether *Inca* and *Carib* branches are both represented. Soares de Souza described a white fava of superior quality and larger than the broadbean of Portugal, which would seem to have resembled the big Peruvian limas.

The major difficulty in the dispersal routes proposed by Mackie is the derivation of the *Carib* branch from Guatemala by way of Yucatán, since the existence of this ethnic bridge is not substantiated by most ethnographic data. However, the lima-bean data do point in this direction. As known at present, from the Russian studies, the lima beans and also the frijoles of Colombia belong with Perú, those of Venezuela (and Guiana ?) with the Antilles and Yucatán. It should be noted that the word "henequen," according to Henriquez Ureña (and also the plant ?), was taken from the *Maya* of Yucatán into the *Taino* culture of the Antilles.

In Coastal Perú there was an extraordinary preoccupation with the pallar as decorative motif. In Mochica art the "lima-bean warriors" are famous. Conventionalized forms are extremely common on Nazca pottery, and in Paracas textiles are many beautifully worked and expert, very exact representations of beans of different color markings (all figured in Yacovleff and Herrera, 1934–35; 3: 287–289). (See also Handbook, vol. 2, p. 175; fig. 21, *c*.) Here this bean had an economic significance unequaled elsewhere, and apparently also a certain symbolism was attached to it.

A curious problem attaches to the cyanide content of the probably primitive races of the cultivated lima. Mackie (1943) called attention to the occurrence of lima beans on uninhabited Socorro Island off northwest México and the poisoning of Captain Colnett's crew there in 1798 by eating these beans. Such beans have been collected on Socorro and grown. They probably may be considered as an escape and are referred by Mackie to the *Carib* line. From the Dutch East Indies through Indochina and Burma (to Réunion) a race of lima beans of primitive characteristics has long been in native cultivation. Throughout southeastern Asia the appearance of high cyanide content in such beans is common and well known. Perennial habit, dark colors, and small to moderate size are prevalent. A genetic basis of the glucoside is probable and possibly rests on a number of genes that became suppressed outside of the Caribbean and southeast Asia by deliberate selection. If, then, southeastern Asia should prove to be a reservoir of the more primitive lima beans, long since extinct in Perú and México, a further problem of the time and manner of trans-Pacific connection is raised by which the American bean was communicated to the native population across the Pacific. The great cyanide-poor white limas of South Africa, on the other hand, suggest Peruvian origin (via Brazil and the Portuguese).

The common bean (*P. vulgaris*) and the (scarlet) runner bean (*P. multiflorus* or *coccineus*) are the principal forms in temperate land (C climates) native agriculture, with wide penetration, however, into tropical margins and, in the United States, into microthermal (D) climates.

The runner bean has been little specialized and everywhere in its range appears to be a secondary legume; the reason is not clear, since it has admirable qualities for cultivation and eating, raw as well as cooked. Even the tuberous roots are a food. On limited evidence the Russian geneticists assign its origin to Central America or southernmost México. It is also common in the Cauca River drainage of Colombia. Little information is at hand as to its occurrence elsewhere in South America. There is no known reason for ascribing great antiquity to it, and it is possible that a fuller knowledge of its distribution, especially as to types, will be useful in tracing later prehistoric diffusions from Central America.

The common bean, with the exception of high altitudes and of tropical regions, is almost coextensive with the distribution of maize. From the southern edge of the Mexican plateau northward, dwarf, bush forms predominate, and there is also commonly, but not always, a segregation of bean field and corn field. In equatorial latitudes, and through South America generally, climbing forms appear strongly predominant in aboriginal agriculture, and mixed planting with maize seems to be the rule. A wild ancestral form may possibly occur in the western Highlands of México and Central America (from Jalisco to Guatemala ?). The Russian studies favor this area for the origin of its domestication, based further on the great variety of primitive characteristics in the cultivated plants and seeds. They consider Perú definitely as a secondary, later center for more highly bred, specialized forms, with Colombia falling into the Peruvian pattern. The beans of the Andean lands are mostly of large size, somewhat cylindrical shape, and the black-seeded forms, so common in México and Central America, are less representative. Despite the great collection of the Russian expeditions and the elaborate genetic analyses based thereon, information is most incomplete on many parts of Latin America and conclusions as to phylogeny and dispersal are still uncertain.

It may be remarked, finally, that Old World legumes in Indian cultivation also need study. These are divergent forms of the cow pea (*Vigna* sp.), not a few areas of cultivation of *Cajanus indicus*, and even some of Oriental *Phaseolus*, all of which need to be localized exactly and the seeds planted for comparison with known Old World forms.

THE CUCURBITS

The Old and New World cucurbits are clearly divided, the New World having produced four genera: *Cucurbita*, to which belong all squashes and pumpkins and some gourds in the English vernacular; *Sicana*, so named from its *Quechua* name but called "curua" in Brazil; *Sechium*, which yields the "chayote" of México; and *Cyclanthera*, cucumberlike when immature. In addition, the Old World bottle gourd (*Lagenaria*) is of immemorial cultivation in America and the vegetable sponge (*Luffa*) is widely distributed in the Tropics.

In the genus *Cucurbita* a minimum of four species is recognized. *Cucurbita maxima*, called "zapallo" in western South America after the *Quechua* name, is exclusively South American in its aboriginal distribution. It is not known to have reached the Caribbean in Colombia, but appears in the northern temperate lands of *Inca* domination. It was spread throughout the warmer parts of the *Inca* realm, and its apparent failure to penetrate northward beyond the *Inca* conquests suggests that it was carried northward by them. The situation in Venezuela and the Antilles is quite unclear. Oviedo seems to have noticed on the islands only the calabash vine, or true gourd. From the Indians of Cumaná, according to Henriquez Ureña, the name "auyama" was taken by the Spaniards as meaning a squash, and it was used in New Granada until the *Quechua* term supplanted it. But what it was has not been determined and present-day Antillean agriculture has imported so many things from all sides that it may be impossible to name the aboriginal squash. Hoehne (1937, pp. 158, 188) recognizes in the "moranga" of northern Brazil *C. maxima*. In Mochica and Chimu pottery there are many faithful reproductions, including a form much like our Hubbard squash. The seeds are found in mass in graves of desert Perú. Southward, in Chile, it is grown to the limits of agriculture, and in middle Chile has developed the most gigantic form of all pumpkins. In late years, Chilean varieties have been brought to northeastern and north-central United States, where they now have become common winter squashes. Here belong also the turban squashes. The species is recognized in its fruit by its cylindrical, often bulbous and spongy, stem and the filling of the central cavity by fibrous placenta and seeds, and its origin is to be placed east of the Andes.

Cucurbita moschata, widely grown in Central America and Colombia, is apparently of Mexican or Central American origin. Bukasov has divided it into two races, white-seeded Mexican and brown-seeded Colombian. The former is the "ayote" of the *Nahua*. The Crookneck form, with its angular stem, is well represented in Mochica pottery. Hoehne considers the "gerumú," much planted in northeast Brazil, as *C. moschata.*

The common field pumpkin, summer squash, vegetable marrow, and ornamental gourd of the United States, *Cucurbita pepo* (the species of most extreme variation in form and size), probably did not get into South America at all, and not strongly into Central America. The cold-land member of the genus is *C. ficifolia,* the black-seeded, watermelonlike vine with figlike leaves. It is now very commonly grown by the Indians in the Andes, much more so, in fact, than in its native Mexican plateau, where it is called "chilacayote." It should be noted that a white-seeded race also exists. In most of the Andes, *C. ficifolia* is called *Mexicana;* in Colombia, *Vitoria.* It is therefore considered a Colonial introduction. Nor is there mention of it in Acosta, Cobo, or other early accounts. If true, this pre-Columbian absence of a cucurbit in the cool lands of the Andes is perhaps the most curious quality in the geographic distribution of the genus.

The importance of the squashes in native economy was and is great. Immature, they are in their season the most important green vegetable. Ripe, they are boiled and especially roasted as an important source of starchy and sugary food. Their excellent keeping qualities make storage possible for months, and they are often cut in strips and dried in the sun or over coals. The seeds are largely used roasted, and in some cases are even more prized than the flesh. Commonly they are sown with other plants, but in areas deficient in moisture they are frequently seeded during the dry season on a stream bar, or even in the stream bed. The marked geographic detachment of the center of each species from the other indicates a plural origin of their cultivation, or else that *C. moschata* is the oldest form, *C. maxima* being a South American, *C. pepo* a North American derivative. The habit of the plant further suggests that it may have come in as a volunteer into primeval fields, there been tolerated, and then deliberately associated by man with the main field crop.

Sicana odorifera is probably to be listed as a native cultivated plant. Cobo said that in Perú it was known as "calabaza del Paraguay" because it was native in that Province. *Sicana* is, however, a *Quechua* name, and, as is "curua," is considered Brazilian. It was eaten, according to Cobo, both raw and cooked, but was prized for its fragrance, as is the case today. It is found widely about houses in the Tropics and, in view of the native names, may be supposed to have been disseminated independently of the Europeans.

Somewhat more important in cultivation is the *Cyclanthera pedata,* undoubtedly of South American origin, and probably from the Caribbean. Cobo gives a good account of it as resembling a cucumber in looks and flavor. It is also cooked. He gave as its Haitian name, "cáygua," and as the *Quechua* term, "achoccha." It is commonly grown in Colombia today.

Sechium edule, the "chayote" of the *Nahua* (also "guispui" in Guatemala: Bukasov, 1930, p. 79) is identified by Cobo only for New Spain. In South America it is known to me only by its *Nahua* name, and this distribution therefore seems modern. The fruit is ordinarily cooked as a green vegetable; its numerous tubers are boiled and roasted (the "chinchayote" of the *Nahua*).

The bottle-shaped gourd (*Lagenaria*) is often cited as the one cultivated plant common to both the Old and the New World, and its dissemination attributed to waves and currents. It is usually thought that the plant derives from the Old World. It is a cultigen as we know it in America and depends on the care of man for its preservation. It is in no sense a strand or marsh plant. The theory of its accidental dissemination involves, in addition to the undamaged transit of an ocean, a waiting agriculturist who carried it in from the seashore to a suitable spot of cultivation. It is at any rate an anciently grown plant in the New World, as the many gourds in archeological sites attest. A variety of types from Peruvian graves is shown by Yacovleff and Herrera (1934–35, 3: 314) who point out also that many forms of the ancient pottery, especially in Nazca, derive from *Lagenaria* shapes. Gourds with designs burned into them are widespread through the old pre-Conquest sites of Coastal Perú and North Chile. In *Quechua* the bottle-shaped gourd was called "puru," the globular one "matti" (now commonly "mate") (ibid. p. 316). From the *Nahua* the term "tecomate" has been applied in North America to the cup gourds, "jicara" to the form bisected for basins. (Hernández, 1942, bk. 2, ch. 8). Pyrogravure, carving, and lacquering of gourds has been and is a well-developed craft from Perú to Michoacán. The growing of the gourds is largely concentrated in certain lowland valleys where selection has given rise to specialized forms for which there is a wide demand in native trade. They are carried further by native trade than is pottery. Shapes range from small cups and dippers, through constricted bottles carried by field laborers, to the great flattened globes, cut in half for kitchen pots and storage basins, and used entire, for floats used in ferrying streams. The assemblage of forms and their distribution have never been studied. Nor have comparisons with Old World forms been made. Oviedo, Cobo, and others pointed out that the "calabazas" of the New World did not serve as food, as did the immature *Lagenaria* in the Mediterranean (and incidentally also in the Orient.) It is generally a hot-country plant, but in Colombia a large form exists that is grown in the cool Highlands of Antioquia.

TROPICAL ROOT CROPS

The early Europeans were much interested by the root crops of the New World Tropics. These were something new to them, for at home they knew only such things as turnips, carrots, and radishes, garden vegetables rather than field crops. In consequence, the early accounts are especially full on these strange new plants and their care and use. The shores of the western Atlantic, first entered by Spaniards and Portuguese, depended on root crops rather than on seeds as food staples. About the Caribbean and on the east coast of Brazil the food tubers and fleshy roots basic to the native economy were chiefly manioc and sweetpotato, but also certain plants of the monocotyledonous families of the yam and arrowroot. The peanut has been considered earlier, under leguminous seed plants.

Manioc (*Manihot utilissima*), "mandioca" in Brazil and Paraguay (from the *Tupí-Guaraní*), "yuca" in most parts of Spanish America (from the island *Arawak*), is thought to have originated on the Coast of tropical Brazil, because of the concentration of *Manihot* species there. It is possible, however, that it was derived from some drier area in the Andean base of the Amazon drainage. (There are such, though not manifest in weather records.) I should prefer an origin on the dryish shore of the Caribbean. Manioc is a cultigen, and has not been referred to a specific wild ancestor. In the course of long cultivation it has practically lost the capacity of reproduction by seed, having been handed down from one generation to another by cuttings.

An indefinitely large number of varieties have been developed, grouped in use as poisonous and nonpoisonous, or as bitter and sweet. The sweet maniocs are known as "aypi" in *Tupí*, and were called "boniato" in the Caribbean. (For discussion of the term *boniato*, see Henriquez Ureña, 1938, pp. 87–94). The range of variation in the species has never been studied satisfactorily and the botanical relation of hydrocyanic acid to other plant qualities is not clear. In eastern South America the bitter and sweet manioc are both grown, often in the same field, and the producers are able to distinguish them with certainty. It has often been assumed that the poisonous form is the older and that the sweet forms were selected from parent bitter stock.

Functionally the two groups are differentiated. The "aypi" is simply boiled or roasted, like the sweet potato. The bitter manioc is subjected to grating, washing, pressure, and baking. The resulting "bread" is "cazabe"; from the colloidal starch tapioca is prepared, perhaps originally an Amazonian Indian process. In general the bitter maniocs are higher in starch content and superior to the sweet group as food.

The sweet group has enormously the wider distribution. (1) It is grown throughout the range of the bitter manioc; that is, the tropical lands of Brazil, Venezuela, and the West Indies. (2) It extended to about lat. 30° S. in Brazil, with the southern *Guaraní* and their agricultural neighbors. (3) Grown in Northwest Argentina, it is also common in the yungas of eastern Bolivia, Perú, and Ecuador. (4) On the Pacific Coast it extends from the Arica area northward beyond South America, and is grown especially where a minimum amount of water must suffice for irrigated farming. It is abundant in the prehistoric graves of the desert. (5) In Colombia it is cultivated in the tierra caliente and also in the tierra templada to an elevation of around 1,800 m. (5,850 feet). (Bukasov, 1930, p. 92, who also made the observation: "In this very dry year [1926] amid maize plantings killed by drought and yellowed fields of sugarcane, the *yuca* fields stand out by their flourishing appearance.") (6) Still grown throughout the lowlands of Central America and southern México, it formerly extended northward about to the northern limits of the advanced coastal cultures, i. e., into Sinaloa. Its Mexican name, "quauhcamote" ("tree" or "great sweet potato"), indicates a late arrival there.

At least some forms of sweet manioc withstand more severe dry periods and require less warmth than do the bitter kinds. Yet the restricted distribution of the bitter manioc is not to be explained by climate alone. Climate does not explain its failure to expand into Colombia and Central America. This indicates either that it was a late form that had not had time to reach these areas, which is unlikely, or that there was a lack of receptiveness to it on the part of the cultures about the western end of the Caribbean. In this connection it may be pointed out that where bitter manioc is dominant, it was the main breadstuff, with maize of subordinate importance, and grown only in one variety, or a few. (Maize and manioc alike do best with a dry season following a rainy one, manioc requiring less rain. The dominance of bitter manioc over maize from the Antilles southward through Brazil (mostly lands of abundant precipitation) is therefore almost certainly not due to climatic advantage).

On the other hand, the sweet manioc is nowhere the staple and hardly anywhere was it prepared as bread. It was subordinate everywhere in the west to maize, which was grown in greater varietal and functional diversity than in the bitter manioc regions. Oviedo's classical account of agriculture about the Caribbean makes this clear (1851–55, bk. 7, chs. 1 and 2). He knew both islands and mainland well, and noted the absence of the bitter manioc in "Tierra Firme" and the importance and variety of maize culture there as compared with its lesser role in the islands. The *Tupí* and *Carib* seem to have been the main carriers of the bitter manioc culture, and in part also the *Arawak*. The absence of the bitter manioc in Colombia including the Caribbean coast suggests a cultural break between it and Venezuela, paralleling the situation with regard to frijol and lima beans. Information is needed for the Amazon Basin; the Spanish accounts from the upper tributaries in general identify only the sweet form.

Cobo (1893, bk. 4, ch. 7) gives details for western South America; Soares de Souza (1851, pt. 2, chs. 37–43) gives a full account of cultivation and preparation in Brazil. A good review of economic botany is supplied by Bois (1927–28, 1: 436–446).

The sweetpotato (*Ipomoea batatas*) had a New World distribution similar to that of manioc, but somewhat wider. (1) It reached farther into the temperate zone of the Pacific Highlands; (2) it was grown in Chile as far south as the Quillota Valley (near Valparaiso), according to Latcham; (3) it was more widely distributed in México and an older crop than yuca, but its northern limit of cultivation barely crossed the Tropic.

The genus of the morning-glory or *Ipomoea* ranges widely through the warm lands of the world, with hundreds of species, a number of which are tuber bearing. Among botanists there have been adherents of belief in an Old World origin of the sweetpotato as well as those who thought it originated in the Americas. The genetic studies of Tioutine (1935, pp. 3–11) make it probable "that the generic relationship between *I. batatas* and *I. fastigiata* is closer than that of the other species." The latter is a wild species of tropical America, a common "batatilla" of Caribbean lands. We may consider therefore the likelihood of domestication of the sweetpotato in the latter area, and more probably on the South American mainland than in the islands or on the Central American side. The sweetpotato belongs in a culture complex that operated by vegetal means of reproduction, that is, by cuttings of plants or tubers, and not by seed reproduction. Western Central America falls with México into the seed complex, and the sweetpotato is to be regarded as adventive there into an older agricultural pattern. It seems also that South America is markedly richer in varieties of sweetpotato than Central America and México, though no adequate collection and study of these have been made.

Under ordinary means of reproduction the sweetpotato is multiplied entirely by plant division. It is now known that occasionally seeds are set, and these are being used in scientific hybridization, but they played no role, it would seem, in the domestication or in the development of the existing varieties, which operated by taking note of bud mutations and planting divisions of the desirable new form. It is possible, therefore, that all sweetpotatoes have been derived from a few ancestral plants which were multiplied by dividing and planting their shoots by generation after generation of planters.

Native names of the sweetpotato have been the subject of two masterly studies by Henriquez Ureña (1938, pp. 15–86): "Papa y batata," and "El Enigma del Aje." "Batata" and "aje" are names derived from the West Indies. The old and now largely disused name "aje" belongs more probably to the sweetpotato than to the yam (*Dioscorea*), though numerous students have applied it to the latter, perhaps by reason of later confusion, just as we confuse yams and sweetpotatoes in the United States. The term "aje" seems to have been given to an inferior sweetpotato of large roots and rapid growth. Oviedo considered aje and batata as closely akin, and among the characteristics of aje which he described that point to its identification with the sweetpotato was the planting of it by the division of the young shoots, a procedure general with the sweetpotato, and hardly applicable to the tubers of yams. The *Nahua* name "camote" has spread through Spanish Colonial influence over much of Spanish America, and has replaced largely the *Quechua* name, "apichu." For a starchy form the *Quechua* designation "cumara" survives from the days of the Conquest (used by the *Inca* Garcilaso). Fortunato Herrera thinks, with some reason, that this was the group described as "ajes" by Oviedo.

The name "cumara," used in Perú and in Oceania, raises the oft-discussed question of the date of the introduction of the sweetpotato into the South Seas. It is not necessary here to resume the views of Rivet, Friederici, Dixon, Nordenskiöld, and others who have engaged in this controversy. The case for the carriage of the tubers by Europeans across the Pacific is weakened by two considerations: *(a)* The extraordinary variety of forms cultivated in the South Seas (20 varieties being claimed for the *Maori*), and *(b)* the fact that the sweetpotato developed races in New Zealand much farther removed from tropical growth conditions than anywhere in the New World. It extended in the South Island well beyond the Canterbury Plain (about lat. 45° S.), the highest latitude reached by aboriginal agriculture anywhere in the Southern Hemisphere. This was about 12° farther south than it penetrated in Chile and 20° beyond its aboriginal Northern Hemisphere dispersal. Such an adaptation to high latitude and very cool summers is nearly incredible for a selection to have been made as the result of casual, late introduction by European sailing vessels. It may also be noted that these Maori forms seem to have been starchy and coarse-fibred, like the cumara of the Andean yungas, and suggest a derivation from an older, and now nearly extinguished American form. The Maori sweetpotato was rated by Hooker as a separate species, though only varietal rank is now accepted (Bois, 1927–28, 1: 317–318).

The ordinary yams (*Dioscorea alata, cayenensis,* and *batatas*) are natives of the Old World. Their introduction with the African slave trade was described by Oviedo for the West Indies and Soares de Souza (1851) for Brazil. The New World Tropics hold a number of wild species of *Dioscorea,* some with edible tubers. In eastern Brazil, in particular, a number are grown (such as *D. dodecaneura, piperifolia,* and *hastata,* according to Bois, 1927–28, 1: 484–485), no information being given as to whether domesticated forms have been developed out of the wild parents. One American *Dioscorea,* the "yampee" (*D. trifida,* to which is referred also *D. brasiliensis*) may be a truly domesticated plant. Its smallish, but reputedly excellent, tubers are rather widely grown in the Atlantic Topics from the Antilles to Brazil. These may be the "carazes" (modern Brazilian name "cara" ?) to which Soares de Souza referred (1851, pt. 2, ch. 44) and which he distinguished from the Old World "inhames" (ibid., ch. 35); the vines were supported by stakes and the mature tubers preserved by smoking.

In the arum family the place of the taro of the Old World is taken by species of the New World genus *Xanthosoma,* called "yautia" or "malanga" in the Caribbean, "mangareto" (Bois, 1927–28, 1: 526) in Brazil. The principal cultivated species is *X. sagittifolium,* with Engler ("Pflanzenreich," 1920, IV, 23E) also listing *X. jacquinii* as of wide insular and mainland distribution about the Caribbean. Bois lists further as cultivated *X. brasiliensi, X. belophyllum, X. caracu, X. mafaffa,* and *X. violacecum* for parts of the Atlantic Tropics. In addition to the tubers, the leaves are used as cooked greens. As in the case of taro, the cultivation is usually in moist lowlands. The yautia was known to Oviedo and Cobo for the Caribbean, and is apparently discussed by Soares de Souza (1851, pt. 2, ch. 44) under the term "taiazes": "the leaves being eaten with fish in place of spinach, and with green beans in place of lettuce, and have a very superior savor; the Indians eat them [the tubers ?] boiled in water with salt, and with large quantities of peppers." In the Peruvian yungas, according to O. F. Cook (1925, p. 100), the roots are dried and stored.

The arrowroot (*Maranta arundinacea*) is widely distributed from Brazil to the Caribbean and is grown in wettish land. The preparation from it of starchy flour, "fecula," is said to be a modern invention, and the name of the plant is said to derive from the older use of the root as an antidote to arrow poison (Schumann, in Engler's "Pflanzenreich," 1902, IV, 48). The name "lerén" (lirén, llirén, etc.) may apply to this plant. The description of lirén by Oviedo (1851–55, bk. 7, ch. 13) and Cobo (1893, bk. 4, ch. 9) clearly does not, but may refer to *Calathea allouia,* the Carib "alluia" also known as topimampur in the West Indies (Schumann, loc. cit.), where this plant is still cultivated.

ROOT CROPS OF TEMPERATE LANDS

The lone New World umbellifer transformed into a cultivated plant is the "arracacha" or "racacha" (*Arracacia xanthorrhiza* or *esculenta*), a major food in the tierra templada of the northern Andes, especially in Colombia. Its extension into the tropical Caribbean may be modern, since it was not described by Oviedo. In the temperate yungas of Perú its use in native economy is less than in northern South America. It is reproduced usually by division of the root crown; it would be interesting to know whether its planting by seed is practiced in native agriculture. The wild ancestor is not known. The failure to penetrate through neighboring Central America and México may argue for the lateness of its cultivation or simply that it was not accepted into the seed-agriculture complex of that region. Neither explanation is very satisfying.

Peruvian archeology has numerous ceramic representations of the starchy roots of the "achira" (*Canna edulis*, probably), still a fairly common market item in Coastal Perú and the temperate valleys as far as Jujuy and Salta in Argentina (Parodi, 1935, p. 141), and often naturalized along irrigation ditches. There may be other cannas grown for edible roots in Latin America (*C. coccinea* and *C. discolor* in the West Indies?).

"Yacón" is the *Quechua* name and "aricona" the *Aymara* term for a tuberous composite (*Polymnia edulis*) grown in temperate valleys from Colombia to Northwest Argentina. Its tubers resemble the *Dahlia*, to which it is related—"on the outside the color of earth and inside white and of the consistency of a turnip. They are eaten raw as fruit and have a very good flavor and much better if exposed somewhat to the sun" (Cobo, 1893, bk. 4, ch. 16). Because of its sweetish, watery quality it is considered a pleasant refreshment; its food value is low and probably lies chiefly in its sugar content.

The "jicama" (*Pachyrhizus* sp.) of the Mexicans has become "xiquima" in the Andes, the older *Quechua* name being "ajipa." The large turniplike roots are edible, the beans poisonous. Yacovleff and Herrera demonstrated the presence of its roots in Peruvian graves and the use of the plant as "decorative motif" in Nasca art (1934–35, 2: 51–66; 3: 282–284). The plant as described by Cobo (1893, bk. 4, ch. 17) is almost unknown in modern Perú, but is still cultivated in the Bolivian yungas. Parodi (1935, pp. 137–141) lately has called attention to the cultivation of both a violet- and a white-flowered variety about Jujuy, and to the taxonomic uncertainties of the whole jicama complex. I am acquainted with it only as a refreshing raw vegetable eaten out of hand like the yacón, in which form it is a very common summer food in México and Central America. It is apparently cooked in the West Indies, where its English name is yam bean, and especially also in southeastern Asia (Bois, 1927–28, 1: 170–172). In South America it is boiled and would seem to have a notable starch content; possibly Mexican and South American jicamas are different species. Old and New World forms have been divided into two species (references in Bois), but the distinction is not sharp, and perhaps all of the distinguishing marks of the supposed Old World species exist also in the American plants. This is another case of a trans-Pacific occurrence of a cultigen, morphologically somewhat differentiated on the opposite sides of the ocean, but almost surely of common origin. In both areas the plant is of concern only to native cultivators.

The starchy root cucurbit, chinchayote, was noted in the section on cucurbits (p. 506).

Aside from the arracacha, the root crops of the temperate Tropics are not, nor are they likely to become, staples replacing other sources of starch and sugar, such as are provided by the maize-beans-squash complex, fully suited to these climes.

ROOT CROPS OF COOL LANDS

The origin of the potato ("papa" in *Quechua* and many parts of Latin America), and its diversity in native agriculture have received new light through the work of the Russian Institute of Applied Botany, especially through the monograph of S. M. Bukasov (1933). As the result of very extensive collection of wild and cultivated materials they have radically redefined the concept *Solanum tuberosum*.

This specific name they would limit to the potatoes of Chile (and possibly the commercial forms of European and North American derivation). In Chile the home of the potato is in the coastal lowlands of cool summers and long summer days, and especially in the wet areas of the south. Possible local wild ancestors were suggested. (They are inclined to exclude the oft-claimed "malla," *S. maglia*, of Chile as ancestor of the cultivated species.) The greatest diversity of cultivated types is in the island of Chiloé and the adjacent mainland on the north, both of which they regard as the cradle of what we of North America know as the potato, which found a similar, congenial home in the high latitudes of the Northern Hemisphere (possibly with incrossing of blood from other Andean (?) potatoes).

The Russian students point out "the restricted area and plasticity" of the Chilean group of potatoes as against the great Andean form assemblage. It is doubtful, therefore, whether the first origin of potato domestication may be assigned to this southern area, marginal moreover to aboriginal American agriculture. Perhaps, rather, in view of the great number of species of tuber-bearing *Solanum* distributed from the North American Southwest to Uruguay, Chile may be regarded as a secondary center of domestication, making use of a Peruvian domesticate after an earlier pattern of potato domestication had been elaborated in the Andes to the north. (The Bukasov monograph assumes a wide geographic gap between the aboriginal cultivation of the Chilean and the Andean potatoes, omitting all North Chile from the area of potato growing. This is in error and means only that the Russian workers did not get material between Central Chile and the Bolivian Plateau. The mountain villages of North Chile have an important and varied potato culture. As a casual observer, I should place these with the potatoes of Bolivia and Perú. The area is of particular interest for future study as probably holding the long-day forms of the Andean potatoes, and possibly as the meeting place with the southern, Chilean, kinds.)

For the Andes the Russian work has established 13 new cultivated species, which they have named. These occupy a large continuous Andean area from the Boyacá district in Colombia to that of Calchaquí in Argentina. Of these *Solanum andigenum* has the widest distribution, and includes within its range most of the areas in which the other species are found, the exceptions being the species of high frost resistance and those of the warm valleys.

For central and south Perú and Bolivia the Russian studies of *Solanum andigenum* have yielded 1 subspecies, 17 varieties, and 34 forms, representing also large ecologic and functional diversity. Most of the kinds grow at altitudes from 3,000 to 4,000 m. (9,900–13,000 ft.). A few, grown around the higher elevation, are somewhat frost-resistant, and these are usually of the "bitter" sorts used in preparing chuñu. Such is the variety "ccusi," with blue or lead-colored tubers; "yani-cusi" in Vargas (1936, pp. 46–47). An important and readily recognized kind is "ccompis," the only white-flowering potato in Perú and widely grown in Bolivia and southern Perú because of its heavy yield.

The pioneering Russian studies have now been greatly enlarged and revised by the collections, cytogenetic examinations, and taxonomic systematization of the Imperial Bureau of Plant Breeding and Genetics, by Dr. J. G. Hawkes and associates. The principal publications to date are all by J. G. Hawkes (1941, 1944, 1947).

This finely conceived enterprise, still in progress, already has given a clearer view of the systematic position and evolution of the cultivated potatoes than we have for most plants. Passing over the examination of wild and weed species, which will be of more and more significance in determining cultivated origins and modifications, I will attempt to give in the following paragraphs a brief abstract of the British findings on the cultivated complex, which is a polyploid series (basic chromosome number 12), ranging from diploids, through triploids and tetraploids to one known pentaploid.

Hawkes accepts 10 cultivated diploid species, individually for the most part of restricted range, but with an over-all extension from Boyaca in Colombia to the Cochabamba region in Bolivia. In general these may be regarded as the more ancestral forms, the ones taken first into cultivation and modified. They are in the main less vigorous and yield fewer and smaller tubers than the higher polyploids, and hence have given way largely to the latter, except in out-of-the-way areas. At the most primitive end of the whole series of cultivated potatoes lie five species, notable for quick maturity, short dormancy, and occurrence at low altitudes and under higher temperatures than are characteristic of other potatoes. These fall into two geographic groupings: at the north (1) the large species of *Solanum rybinii* of the Colombian departments of Boyaca, Popayán, and Pasto; (2) *S. kesselbrenneri* of inter-Andean valleys of Ecuador and southern Colombia; and (3) *S. ascasabii* from the Ecuadorean east-Andean montaña. Far to the south (4) *S. phureja* is at home in the temperate yungas east of La Paz; and (5) *S. cardenasii* about Cochabamba. Most diversified of the diploids in variety and habitat is the *S. stenotomum*, which extends from Central Perú to Central Bolivia. To it belongs the famous jet-black chapiña, used for dyeing rather than food. Notable also is the diploid *S. goniocalyx*, the white-flowering, golden-fleshed *Papa amarilla* of Perú, prized for its nutritiousness and nutty flavor, its climatic position apparently being cool temperate. *S. ajanhuiri* and some clones of *S. stenotomum* are notably frost resistant, but in the main the diploids are dominant at the lower elevations of potato growing.

Far and away the most important potatoes are the tetraploids, which Hawkes has placed in one great species complex, *S. tuberosum*, with two great geographic subspecies, *andigenum* and *chileanum*, disagreeing in this respect with the Russian views. Hawkes makes a strong case for the derivation of the Chilean potatoes from Andean lands, pointing out that there are no diploids known, wild or cultivated in Chile, and that the only other possible Chilean wild ancestors, a few tetraploids, are hardly suitable and seem to be merely feral, namely low-yielding types that have been dropped from cultivation, but not yet exterminated. He sums up his case as follows:

> The tetraploid potatoes arose in the Peruvian and Bolivian Andes, spreading rapidly, chiefly by human agency. The higher yielding types moved more quickly than the lower yielding ones and hence became especially abundant at the edges of the distribution range. They are, therefore, to be found in Chile, the southern end, and in Colombia, the northern end of the Andes. In the south (Chile) the widely different climatic and latitudinal conditions, coupled with a more or less complete geographic barrier, aided in the differentiation of a new

species, *S. tuberosum* s. str. [Hawkes, 1944, p. 108. In the 1947 publication this is reduced to the subspecies *chileanum*.]

The triploids are an indefinitely large lot of casual hybrids, a few superior clones having become established by man through vegetative reproduction. Chiefest of the triploids is the luki, *S. juzepczukii*, most remarkable for its frost resistance, and often the dorminant tuber at high altitudes in northern Bolivia and adjacent Perú. Bukasov's original surmise that this plant, which is sterile, originated by a cross of the wild *S. acaule* and a cultivated diploid, has been confirmed lately by Hawkes (1947, p. 628), who succeeded in reconstructing it by crossing the wild *S. acaule* with the cultivated *S. stenotomum*. The one cultivated pentaploid, *S. curtilobum*, at high altitudes from Cuzco to Potosí, is a bitter tuber and is prepared by freezing, the plant being markedly frost resistant.

The preparation of potatoes for indefinite storage as chuñu and moraya utilizes (1) certain forms of *S. andigenum* (as ccusi, huaña), and (2) the three high mountain species, *S. juzepczukii* (luki or rukki), *S. curtilobum*, and *S. ajanhuiri*. For the most part these chuñu potatoes are bitter kinds (papas amargas), not suitable for consumption by boiling or baking. However, some nonbitter potatoes may also be thus used, such as the form of *andigenum* called "alccai huarmi" (No. 16 of Bukasov; also Herrera (1921).) The botanical meaning of the term "luqui" (rukki), applied to certain bitter potatoes used in chuñu remains undetermined. In general, also, the bitter potatoes are late-maturing, have some degree of frost resistance, and constitute the group grown at the highest altitudes (3,800–4,300 m., about 12,500–14,000 ft.). The whole culture complex of plant and product is tied to the cold limits of agriculture, especially to the part of the puna centering upon the old Collao. The process of freezing, thawing, and drying by which chuñu is produced, and that of refining it into moraya or tunta has been well described by Cobo (translation in Safford, 1925). (See also Handbook, vol. 2, pp. 527, 578.).

The complex constitution of the cultivated potatoes and their geographical distributions does not admit of an unequivocal interpretation as yet, but the data indicate a revision of usual views on Andean agriculture. There is every probability that the diploid species are the oldest in cultivation, only the *Papa amarilla* having quality and yield to make it a successful competitor with the higher polyploids. The 10 known diploid species range from warm temperate valleys to the cold extreme of agriculture in the tropical latitudes of the Andes; insofar as known, they do not enter extratropical latitudes. Within the Tropics, in other words, they form a series of cultigens, connecting at the lower end with tropical root crops, at the upper limits reaching into the coldest spots where tillage can be practiced. Five of the ten known cultivated species are restricted to the lowest altitudinal limits of low-latitude potato growing, and these "are altogether more primitive and more closely related to the wild species" than other cultivated potatoes (Hawkes, 1944, p. 99). Four of the five "most primitive" species belong to the far north, Colombia and Ecuador. The superior *S. goniocalyx* would appear to belong zonally immediately above them. The *S. stenotomum* complex falls into the heart of the Andean Highland potato country, from Central Perú to Central Bolivia; the frost-resistant *S. ajanhuiri* to the colder parts of north Bolivia. The luki, notable as a source of chuñu, has been demonstrated to be a *stenotomum* x *acaule* cross, the latter a weed in fields at high altitudes. The diploids and their known hybrid cultigen, therefore, by themselves may have provided a series of stepping stones, perhaps from North to South, and from low to high altitudes, for the establishment of potato culture. Root crop cultivators, coming originally from tropical lowlands, may well have found in wild tuberous *Solanums* a gradual means for ascending as cultivators to the cold puna. (Further comment on this thesis is given below.)

The *S. tuberosum* (tetraploid) complex developed later, probably out of both cultivated and wild diploid ancestry. Their greater yield and superior vigor caused them to be substituted increasingly for the older diploid lines and to dominate the Altiplano of Bolivia and Perú. Still later they were carried to the cold lands of Colombia and down to the cool coasts of Chile, where they differentiated into one varietally diverse subspecies. The comparative advantages of *S. tuberosum andigenum* in highest altitudes is not evident, and at warmer levels they have not been able to take the place of more primitive sorts. Their common origin is attributed to the Altiplano centering about Titicaca.

The major cultivated *Oxalis* is the "oca" (*Oxalis crenata*), probably the second most important root crop of the Highlands. Like the Andean potatoes, it is markedly photoperiodic and seems to find its highest latitudinal limit somewhere in northern Argentina and Chile (Puna de Atacama ?). (Farther south *Oxalis* has been cultivated in the Coastal lowlands from Coquimbo to Chiloé, perhaps *O. tuberosa*, the data being disorganized; see Latcham, 1936 b, pp. 90–92.) Northward, Bukasov (1930, p. 237) reports it as extending into the Venezuelan Andes. In Perú Yacovleff and Herrera (1934–35, p. 308) name five sweet varieties. It is eaten raw and cooked, but is most commonly seen offered in the markets as "cavi," dried in the sun and considered as having a chestnutlike flavor. The process, in which much of the acid is lost, is described by Weddell (cited in Bois, 1927–28, 1: 80–81).

A heavily yielding bitter variety is prepared by a method identical with the making of chuñu and the product called "caia" (ccaya).

The *ulluco*, or "papa lisa" (*Ullucus tuberosa*) apparently exists as a single cultivated species (Bukasov, 1930, p. 232), from the Bogotá area southward into northern Argentina (Parodi, 1935, p. 141). Its smooth red, yellow, or variegated tubers are seen fresh in the markets more commonly than oca. It is a satisfactory source of starch and sugar, but rather insipid, and its consumption is mostly confined to Indians.

The tuberous nasturtium (*Tropaeolum tuberosum*), called "añu," "isaña," or "mashua" in the central Andes, and "cubio" in Colombia, may be sufficiently differentiated between the Colombian and Peruvian forms to constitute two distinct species (Bukasov, 1930, pp. 227 ff.) The tubers are too sharp in flavor to be eaten raw. In Bolivia a chuñu is prepared from them, named "taiacha" (Weddell, *in* Bois 1927–28, 1: 78–79). The plant received emphasis from the chroniclers because of its reputed antiaphrodisiac properties, Cobo for instance stating the the *Inca* emperors fed their armies on the march with such tubers "that they should forget their wives." (1893, pt. 4, ch. 18).

Least among the highland root crops is "maca" (*Lepidium meyenii*), a relative of the peppergrass. Cobo gave its occurrence as restricted to—

> the province of Chincha-cocha [Junin?] where it grows in the highest and coldest parts of the sierra, where no other cultivated plant succeeds. The root is of the size and form of a Muscadine pear (cermeño), pearly-white inside like a turnip, and after drying is much reduced and has the appearance of dried pears. It is sweet and of good flavor; it is eaten after drying, both boiled and roasted. It has a strange quality, that wherever planted one year, it exhausts the soil in such a manner that in more than ten years it is impossible to return to planting that land, and in order that it may not be frozen with the continuous snows and frosts which prevail where it is grown, the Indians are accustomed to cover it with straw until the time for harvest. [Cobo, 1893, pt. 4, ch. 15.]

Diversity, staple use, and geographic extension make it seem reasonable that Andean Highlands, like the tropical lowlands, owe their basic agriculture to reproduction by plant division. It is possible to assign to the potatoes the leading role in the agricultural colonization of the Andes, except for the one fact of the existence, side by side with the potatoes, of the lesser tuberous crops just noted. The only one that seems to have its own ecologic niche is the maca. All the rest are grown under the same conditions of cold climate and under the same edaphic situations. None has any peculiar place in economy, kitchen, or diet. The potatoes in general produce more, have better food value, and are perhaps more tasty. It is difficult, therefore, to explain the presence of less useful tubers as of later origin than the more useful ones. Oca, ulluco, and añu are real cultigens, bred to differ largely from their wild kin. Why should people have troubled to select inferior tuber-yielding plants, if they had better ones to hand in potatoes?

It seems to me, therefore, that we have in these minor tuber crops the remnants of the oldest Highland agriculture; that long before potatoes were bred to grow on the bleak reaches of altiplano and paramo, these microthermal native tubers had made sedentary life possible by supplying starch food and had been made into domesticated plants. Also, the storage problem had been solved by inventing chuñu making and this was transferred later to potatoes, when these became developed for puna climate cultivation. Between the earliest cold-land and warm-land root crops (oca, ulluco, añu vs. manioc, racacha, and achira) there may remain a sensible climatic gap that was bridged by the cultivation of mesothermal diploid potatoes. In this case the major course of primitive potato breeding has been upslope into colder and colder lands, with gradual replacement of the earlier cold-land tubers.

GARDEN PLANTS OF THE NIGHTSHADE FAMILY

The Old World distinction of tillage, as field or as garden, was largely lacking in the New World. New World cultivation was really gardening. Columbus, for instance, properly referred to the landscape about Puerto Bello as being like a painted garden (*huerta*). On the other side of the Atlantic, field crops were not used until their fruits had matured. There was a definite, usually brief harvest season and the time of gathering the ripened crops was marked by harvest festivals. Green vegetables in the Old World were a separate lot of plants cared for in special plots by a different mode of culture. In the New World, on the other hand, the major food crops also yielded for the most part the fresh vegetables. Regularly, an important part of these was consumed during different stages of the period of growth. With maize, use began with the collection of the oil-rich pollen. Everywhere an impressive variety of dishes was prepared from maize grain in the milk and soft-dough stages. Beans were used first as green pods; later the immature beans were cooked. Squashes yielded a first harvest in their blossoms; the fruits were boiled as green vegetables at all stages prior to maturity. Thus it was with plant after plant. Leaves, blossoms, and immature fruits supplied salad and pot vegetables from the same plants that by their mature fruits furnished the staple foods of the Indian communities.

The nightshade family (Solanaceae) has been much more important in the New World than in the Old World in yielding cultivated plants. In the latter such minor edible fruits as the eggplant and the Jerusalem-cherry were domesticated, and the drug plants developed were belladonna, mandragora, and henbane. In addition to potatoes,the New World cultivated for food and condiment species of *Solanum*, *Capsicum*, and the genera collectively known in gardening as tomatoes; poisonous plants taken under human care were Nicotianas and Daturas.

The genus *Solanum* has provided an additional cultigen, more fruit than vegetable, in *S. muricatum.* Formerly known in *Quechua* as "cachun" it is now most commonly called "pepino", sometimes, in English, "melon pear." Though flowering freely like a purple-blossomed potato, good races of the plant have lost the capacity of seed production. The better sorts contain no or only vestigial seeds and are therefore reproduced by cuttings. It is a plant of temperate climates, grown as an herbaceous perennial in the coastal area of Perú and south to Norte Chico, Chile. In Ecuador and Colombia it is found in valley cultivation between 1,200 and 2,500 m. (4,000–8,000 ft.) above sea level. There is a good deal of variety from place to place in shape, size, color, and quality, the best tasting being somewhat like a cucumber and somewhat like a pleasantly subacid melon. The Peruvian varieties are the more highly bred, the Colombian ones more seedy and primitive (Bukasov, 1930, pp. 295–300). Its cultivation probably began by cuttings in temperate valleys of the northwestern Andes. Its spread northward from South America is probably Colonial. It is represented in various Peruvian pottery, clearly recognized by the characteristic discontinuity of stripes.

The naranjilla (*Solanum quitoense*) of the fruit drinks of Ecuador, ranges from Baños to Otavalo, 1,500 to 2,600 m. (5,000–8,500 ft.). According to Popenoe (1924, pp. 133, 149) there is no information on degree and age of its domestication.

The husk tomatoes or groundcherries (*Physalis*) are placed by Bukasov (1930, 286–291) into a Mexican group which are glutinous and not sweet (*P. aequata* or *ixocarpa* and *P. angulata*) and the sweet-fruited aromatic Peruvian species (*P. peruviana*) called cape gooseberry in the United States. In México the groundcherries bear the name "miltomate," or tomato of the milpas, a term that may signify planting with other crops in the milpas or volunteering among such crops. They are commonly grown and widely marketed through México and Central America; they keep for a number of months, and are used cooked or in sauces with chile. The plant is an annual, with greenish to purplish fruits that commonly burst their husks. The Peruvian species is a perennial with an orange-colored fruit that does not fill the husk. It is commonly cultivated northward through Colombia.

The history of the tomato (*Lycopersicum esculentum*) is most obscure. The usual reference of its origin to Perú has little in its favor except the fact that several wild species of the genus belong there, none of them, however, being indicated as ancestor. The use of the tomato in the diet of Indians and common people is much more incidental in Perú than in México and Guatemala. No native name is known for it in Perú, and its archeological occurrence there is doubtful. The primitive, semiwild (and wild?) cherry tomatoes (variety *cerasiforme*) are widely distributed about clearings and in old fields through the lower lands of México and Central America but also occur thus in Perú. These little tomatoes are often grown in back yards with some selection as to size and quality. The name "tomato" is *Nahuan.* In México the true tomato generally is called "jitomate" to distinguish it from *Physalis* and other solanaceous fruits. A study of "tomate" words, including both plants and place names, is needed. There are native names also in *Mayan*, but none apparently in languages of lower Central America or north of Central México. It has been remarked repeatedly that Hernández in his description of the plants of México did not include the tomato. Bukasov suspects that its real domestication is post-White and that earlier it was a volunteer in milpa crops (1930, pp. 273–287).[5]

The tree tomato (*Cyphomandra betacea*) is widely grown in western South America in temperate valleys (Popenoe, 1924, p. 134, says chiefly between 1,500 and 3,000 m., 5,000 and 10,000 ft. It is a common garden plant in every city of the Ecuadorean basins, including Quito. The tree tomato is not known in the wild state (Bukasov, 1930, p. 295).

The chief condiments of the New World are fruits of the genus *Capsicum.* These so-called peppers are known as "ají," from the island *Arawak*, through nearly all Spanish South America, and as "chile," from the *Nahuan*, in México and Central America. The homeland of the original *Capsicum* peppers remains undetermined while we await a better knowledge of Brazil and Guiana, whence a great variety of species have been reported in considerable systematic confusion, and with much uncertainty as to what is wild and what is cultivated. In mild climates the New World peppers naturalize themselves readily, partly because birds attack the ripe fruits eagerly. Views on classification range from grouping all the condiment *Capsicum* under one or two species to the making of scores of species, and from considering many of them as wild to saying that none has been found in a truly wild state. An uncertain guess at present is that there are two wild species, *C. pubescens* and *C. frutescens.* Both are semiwoody perennials of *Aw* climates. The former, the "roccoto" of the *Quechua*, violet-flowered, globular-fruited, was a common pepper of

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[5] James Jenkins (1949) in a study published since this paper went to press clears up the historical confusion, and attributes the amelioration of the plant largely to native cultivators along the Gulf of México.

Perú in Conquest days (e. g., one of the three peppers named by Guamán Poma, and called "el común" by Garcilaso). The *C. frutescens* fruit is far more widely distributed, and perhaps the small-berried variety *baccatum* is the basic form. The latter is reported as having great varietal diversity in Brazil, but it is also very common through the hot lands of Central America and México, where it is usually known as "chiltepín," the small, fiery green pepper. The cayenne pepper is usually regarded as a garden form of *C. frutescens.*

Most of the cultivated peppers are herbaceous annuals constituting the species *Capsicum annuum.* They are grown (1) in low latitudes at altitudes intervening between the hot lowlands and the cool highlands; (2) in the tropical margins in areas of *Cw* climate; and (3) beyond the Tropics, as in Chile, in sunny valleys with long summers. The species is definitely a cultigen and seems to have been derived from *C. rutescens.* The greatest diversity of forms is found in México (and also in Brazil?). The Russian collections register a marked impoverishment of variety about the Caribbean. In Perú there are types of advanced breeding, but no great diversity of form, a conclusion that is supported also by the archeological record. Judging from historical accounts, the role of the pepper in South American Indian fare appears to have been larger in the Conquest period than at present. In México, however, the cultivation of chile has not diminished in significance. Green, ripe, and dried, each kind has its special uses. Villages still are noted for a particular chile which is carried to distant markets. The greater survival of culture traits based on chile in México is probably associated with greater aboriginal importance. The data of Hernández, for instance, on growth and use of different species of *Capsicum* are unmatched by any records from South America. Speculation as to the place of origin of the annual peppers requires more knowledge of the philogeny of the group. If the perennial small-berry (*C. frutescens*) peppers are native to a large part of the American Tropics, instead of being naturalized, a plural development of the annual peppers may have taken place through culture. We are sure only that breeding of the annual peppers was carried farthest in México (botanical data especially in Bukasov, 1930, and Bois, 1927, vols. 1, 3).

There are two cultigen tobaccos, *Nicotiana tabacum* and *N. rustica.* The former has been determined by Goodspeed and Clausen as a hybrid formed from *N. tomentosum* and *N. sylvestris.* The wild *sylvestris* is found in the Province of Salta in northern Argentina; the wild *tomentosum* has a wider range, through the yungas of Perú and Bolivia. It is not known that the two species overlap in their natural range. It may be, therefore, that one of these was taken under cultivation and thus carried to a place where hybridization with the other resulted. In any case the cultigen *N. tabacum* should have originated in the eastern valleys of the Andes, probably in Bolivia. Thence, one may surmise, it was carried down Amazonian tributaries into the flood plains of the Amazon, through Guiana, and into the Antilles. The manner of its introduction into Europe records also a spread part way through the east coast of Brazil. Ethnically it would seem to be associated mostly with *Arawak*, *Carib*, and *Tupí* peoples. Its distribution coincides reasonably well with that of the bitter manioc.

On the other hand, *Nicotiana rustica* was spread almost to the farthest limits of American agriculture, apparently from Quebec to Chiloé. This was, of course, the tobacco of the Indians of eastern North America, the "piciete" of México and Central America, and probably the "petúm" of Brazil. Its use appears to be strongly coincident with the distribution of the elbow pipe. Its very great range, involving high latitudes, makes it proper to consider it as an older cultivated plant than *N. tabacum*, which did not extend beyond tropical climates. It has strong narcotic properties and was, therefore, probably the more suitable plant when ceremonial smoking was introduced. It is not known whether *N. tabacum* was established on the mainland of Central America or in México. The accounts of Hernández (1942, bk. 2, chs. 107–112) make clear that the name "yetl" was applied to unrelated medicinal (narcotic?) plants. In his lengthy description of "picietl" he notes briefly another tobacco as "quauhyetl," the great "yetl" which was *tabacum*. Since the account was written after the Spaniards had begun to cultivate *N. tabacum* in México, it may refer to the plant introduced by them from the islands. "Piciete" or "picietl" is the usual early name for *N. rustica* in México and Central America, and it is still cultivated widely in remote settlements north through Sonora. Prof. Roy Clausen has recently pointed out in a genetics seminar at the University of California that *N. rustica* also is a hybrid, derived from species native to the west side of the Andes in the borders of Ecuador and Perú, that is, in the margins of the ancient Mochica and *Cañari* lands. It too, therefore, is an old South American domesticate which appears to have spread in much the same fashion as did maize.

The most puzzling thing about both cultivated species of *Nicotiana* is their place of origin within the one agricultural area of the New World in which there is neither historic not archeological evidence of the smoking of tobacco. Clearly, therefore, Nordenskiöld was right in judging that smoking was a secondary use of tobacco. The solution of the problem of the early use of tobacco may involve the relationship of the chewing of tobacco to the chewing of coca. May its use as a masticatory (or snuff?) have preceded smoking, and smoking later have extinguished the earlier use except in a few areas? May the chewing of coca have replaced that of tobacco in the Andean lands and presented an effective resistance to the diffusion of smoking when that habit got established to the east or north? It is very perplexing that the two cradles of tobacco domestication should have abandoned the use of the plant, except as a minor drug.

CULTIVATED FRUITS AND NUTS

Some of the plants previously discussed, such as the pepino and naranjilla, may be classed as fruits. Some herein considered as fruits, such as the avocado and pejibaye, are substantial foods. No definition is offered for the cultivated items here assembled, which we should call fruits in English. In order not to get entangled in a functional classification of various cultures and domestic uses, the arrangement here followed is in botanical order (Englerian system).

Palms.—Probably only two palms in the New World were truly domesticated in aboriginal culture, the coconut and pejibaye. The others appear to be unmodified wild species, which may receive some protection in native economy or may occasionally be planted about houses and fields.

The domestication of the coconut (*Cocos nucifera*) has been assigned by O. F. Cook to an American origin (1901, 1910). These studies are still the most significant contribution to the subject even though the conclusions are not sustained in toto. The evidence that coconuts were grown on the Atlantic side of the New World in pre-European days is inconclusive, but there can hardly be doubt as to the tropical Pacific shores. Oviedo is an adequate and explicit witness of their establishment in great groves in Panamá, Costa Rica, and on Cocos Island, and he was one of the first Spaniards to become acquainted with Central America. It is possible that such groves of coconuts existed as far north as the coast of Jalisco. Cook has presented strong arguments that the distribution of coconuts along tropical sea coasts is the result of deliberate planting by man and that they do not establish themselves by being washed onto beaches. The earliest known groves in the New World were in part along the coast and in part at some distance inland, but then, as now, apparently always as groves, and not scattered through the native jungle or brush. Cook is further of the opinion that these plantations were not made by chance contacts on the part of South Sea Islanders, but that the plant originated in the New World, and was there fashioned into a cultigen, and was taken westward from America across the Pacific. This evidence rests on the following: (1) The New World concentration of almost all the species of palms related to the coconut. (2) Cook's hypothesis that the primitive cultigen originated in interior tropical valleys where salt springs impregnated the soil. This condition is frequently met with in the valleys of Colombia, such as the Cauca, where near relatives of the coconut are native. (3) The seed is a remarkable mechanism specialized for germination in climates having a long dry season, rather than for facility in marine distribution. (4) The varietal simplicity of the coconut in the New World, as contrasted with the great multiplicity of forms across the Pacific, is explained as showing that "the greatest and most definite variations of the cultivated plant are much more likely to occur and be preserved outside its natural range, where intermixture with the wild type is prevented." The complete hypothesis of Cook has met with resistance, especially because it requires an ancient skill in navigation and because the coconut has had little significance in American economy, as compared with that of Indonesia. The thesis remains, however, to vex the question of origin of this great cultivated plant.

The pejibaye, or peach palm (*Guilielma utilis* or *Bactris utilis*) is one of the spiny-trunked palms with hard, dark wood commonly called "chonta" in South America. In many cases it has lost the capacity to produce fertile seeds and is reproduced by planting sprout cuttings. It is, therefore, the most striking arboreous element in the agricultural complex that depends on the planting of cuttings and tubers. The palm is said to be unknown in a truly wild state. Its range is from Nicaragua southward into Ecuador, and southeastward down the Amazon indefinitely far into Brazil. Its climatic distribution is mostly within the *Aw* and warmer parts of the *Cw* climates (map 9). The firm starchy fruits enclose a small oily seed which is wanting in many cases. The fruit is not eaten raw but is boiled; it is a staple food, with a chestnutlike flavor. O. F. Cook (1910, pp. 308–309) has good illustrations and quotations from A. R. Wallace and Spruce, the latter suggesting that it may have originated on the east side of the Andes in valleys of limited rainfall. The location of its cultivation may identify it with the proto-*Arawak* and proto-*Chibcha* areas as a quite old cultigen (account and illustrations in Popenoe and Jiménez, 1921).

Bromeliaceae.—The term "pineapple" (*Ananas sativus*) is a somewhat mixed assemblage genetically. In particular, it is not clear whether there is one species in the genus *Ananas*, or a number, nor do we know to what extent the uncultivated forms are wild or spontaneous. Small-fruited, long-leaved, spontaneously growing pineapples commonly called "piñuelas" occur at least from Panamá to Paraguay. Oviedo, in his lengthy discourse in praise of the pineapple (1851–55, bk. 7, ch. 14), having described the fine cultivated sorts in "Tierra Firme," adds that a lesser kind also grew wild in great quantity. This may be the *Ananas magdalenae* of Standley (1928) described by him as forming impenetrable thickets in the forests and yielding a red fruit up to 15 cm. (6 in.) long, edible raw or cooked. Cobo (1893, bk. 5, ch. 17) described another such subspontaneous form from Santa Cruz de la Sierra, where it was principally used for making wine. The extent to which these piñuelas are primitive pineapples or degenerate ones is not known. They are reported for the most part out of areas in which pineapples are cultivated of old. Cultivation has produced in the pineapple again a seedless plant, dependent upon vegetative division for reproduction. According to Oviedo, there were more and finer forms of it on the mainland than in the islands. It extended into México at least as far as Jalisco. Southward on the Pacific Coast it was and is very important in the lowlands to northern Perú. From Andean valleys of Ecuador, Popenoe records an extensive production to 1,500 m. (about 4,900 ft.) and an incidental one to 2,300 m. (about 7,500 ft.). To the *Quechua* it was known as "achupalla," carried in from the eastern yungas and probably cultivated through a continuous strip of territory into Paraguay. French and Portuguese brought the name "ananas" and its fame from Brazil to Europe. Throughout northern and eastern South America it appears to have been a familiar fruit for all Indians, a common source of wine, and in many cases a principal source of cordage. It may have originated in some northern inter-Andean valley, along with other plants of the kinds cultivated by division. At any rate, it penetrated pretty far to the northward into the seed culture area of Central America and México and was adapted to cultivation at altitudes far above those of tropical climates. Its ecology points strongly toward origin in AW climates bordering on the semiarid.

Musaceae.—The plantains and bananas (*Musa paradisiaca*) originated in southeastern Asia and were there bred into a great variety of seedless cultivated forms. Their presence in the New World is considered by many as due to post-Columbian introduction. Nordenskiöld has marshaled strong arguments for this view, the most convincing being the absence of notice of this plant by the first explorers of the American Tropics. In view of its conspicuousness and usefulness, it should at least have been recorded by some of the early observers who took notice of lesser plants. The etymologic evidence collected by Nordenskiöld is inconclusive, there being a multitude of native names, in part of unknown meanings and derivation. The origin of the name "plátano," applied by Spaniards in the New World, is obscure, and apparently was not derived by transfer from the name of the Old World plane tree (*Platanus*), but may be from the *Arawak* or another Indian language of the Caribbean mainland.

The species is commonly subdivided into two subspecies, the plantain proper (*normalis*) and the banana (*sapientum*). The former is nearly always cooked and served as a staple in the diet; the latter is eaten raw as a fruit, and prepared by cooking to a lesser extent. Oviedo's famous account, describing the introduction to the West Indies from the Canaries, refers to the banana, though not by name. Soares de Souza (1851) describes bananas under that name as introduced into Brazil from São Thomé. Some, perhaps all, of the bananas were brought from the Old World by the Spaniards and Portuguese.

The case is not so clear for the introduction of the plantains. (1) In contrast to the bananas, these are little used by Whites but are characteristically and intimately associated with Indian economy. (2) It is among them that most of the native names are found. (3) Their varieties differ, at least in part, from those of the Old World. (4) During the second half of the 16th century they were already widely distributed through the Tropics of the New World from southern Brazil to Jalisco, México, and were commonly a staple of Indian diet of diversified use. The multiplication of the plantains is more difficult than that of a seed-bearing plant. The mature rootstocks need to be dug up, divided, preferably dried for a while, and then replanted. This species is an extraordinarily poor volunteer, and its spread must have been almost entirely by deliberate and rather careful planting. (5) During the second half of the 16th century, the plantains were already considered a native crop. They are thus classed, without exception so far as I know, in the numerous Relaciones geográficas. Garcilaso de la Vega, Father Acosta, and Guamán Poma, all three of whom were attempting to distinguish aboriginal from introduced crops, stated that the plátano was of pre-Conquest cultivation in Perú. Thevet published in 1558 from observation a circumstantial description of plantains ("pacoba") as grown by Indians in the coastal area of Rio de Janeiro. The observations of Léry, made about 2 years later in another part of the French coast of southern Brazil, appear to describe under the name "pacoaire," a type of banana. Soares de Souza (1851), whose observations began some time later on the coast of Bahia, has left an account of three kinds of what he considered native "pacobas" and, in addition, of the bananas that had been brought from São Thomé and were eaten especially by Negroes (Hoehne, 1937, pp. 120–121, 150–152, 221–224).

Whether introduced before or after Columbus, the plantains became a foodstuff second only to manioc in the Tropics. In mesothermal highlands having sufficient rain, less warmth-demanding forms are much grown to the edge of the tierra fría, but many of these are of modern introduction, such as *M. cavendishii.*

Annonaceae.—The guanábana, or soursop (*Annona muricata*), is widely documented in early cultivation, from Nicaragua to the Coastal valleys of southern Perú and far through the yungas. It was also reproduced many times in the Mochica pottery. It extends somewhat beyond tropical limits both as to altitude and latitude.

In the second subdivision of the genus the most important cultivated species is the chirimoya (*A. cherimola*). This is distinctly a nontropical tree, most at home in the temperate Andean valleys, but apparently also cultivated of old in Central America and perhaps in Brazil. Popenoe (1921, pp. 331–336) has described the apparent native home of the tree in the Loja area of Ecuador. Its wild habitat probably extends into similar valleys of north Perú. A considerable number of cultivated variants have been developed, and Safford recognized three such varieties in the graves at Ancón (Yacovleff and Herrera, 1934–35, 3: 276). The sweetsop, or anona (*A. squamosa*), is restricted to tropical climate and does best in areas with a marked dry season. The name "anona" is also often given to *A. reticulata*, the bullock's-heart of the British West Indies and "mamon" of Cobo. It is easily distinguished from the former by its smooth surface and yellowish to reddish-brown skin. Both species occur wild or perfectly naturalized in many parts of the American Tropics of the *Aw* and *Amw* climates. Neither species appears to have been altered by selection to the degree of the chirimoya or even the guanábana.

Lauraceae.—The avocado (*Persea americana*) was already known to Father Cobo in its three principal races: (1) The green-skinned fruit with a rather thin, tough rind that peels easily and often has the size and shape of a citron, known to Cobo as grown especially in Yucatán; (2) the thick, rough-skinned, large-fruited form, especially in Guatemala; (3) the small-fruited Mexican pear-shaped type, with a green skin as delicate as that of a plum. The first is now called the West Indian group, the second the Guatemalan one. The third is the common Mexican avocado, the variety *drymifolia*, with anise-scented leaves (Standley, 1920-26, 2:290–291). The first is most nearly restricted to tropical lowlands. Popenoe says that it is grown in Ecuador in the lowlands, but extends rather commonly to 1,500 m. (about 5,000 ft.), whereas the third type is there cultivated mostly between 1,500 and 2,600 m. (about 5,000 and 8,500 ft.). Oviedo limits his description explicitly to the "Tierra Firme." At his time the Spaniards of Panamá had not yet learned the *Nahua* name "ahuacate" and called the fruit a kind of pear. The ones Oviedo knew were large, big-seeded, and tough-skinned. In Nicaragua he found them planted in the "heredades e plazas o assientos de los Indios, e por ellos cultivados." Apparently they were not known to Oviedo in the West Indies. Their derivation is undoubtedly from Central America and México, the anise-scented type being perhaps the basic form. To the north of Panamá the "ahuacate" is still a more basic part of a native economy and culinary art than farther south.

Cieza, on passing southward through Colombia, first noted the use of the name "palta" in the upper Cauca Valley and Garcilaso later gave the explanation that it was thus known in the lands of the *Inca* because it had been introduced from the north by way of the *Palta* Indians of Ecuador. Apparently it had not been known in Perú long before the Conquest, for only a single Peruvian archeological find is recorded by Yacovleff and Herrera (1934–35).

Rosaceae.—The "capulí" (*Prunus serotina*) is one of the commonest fruits seen today about highland villages and markets from central Mexico to southern Perú. The name used throughout the Andes is derived from the *Nahua* "capulín," the common black cherry of México that bears its fruit in racemes. The capulí is considered a cultivated form of the semicultivated Mexican capulín, and the latter as the southern equivalent of the common wild black cherry of the United States. It was introduced into the Andes by the Spaniards (Cobo suggests by way of Lima) and has now become characteristic of Indian settlements to an altitude of 11,000 and even 12,000 feet (about 3,400 to 3,700 m.). It is now grown more largely in western South America than in México or Guatemala, and the fruit is often larger and much finer than in the north (Popenoe and Pachano, 1922, pp. 51–62).

Leguminosae.—Various leguminous trees are protected in fields and about houses, and some of them, like the "guamuchil" (*Pithecolobium dulce*), are semidomesticated. Several species of the genus *Inga* rate as cultivated trees. They are grown chiefly for their great heavy pods that contain a sweet pulpy pith. Fresh, they are eaten out of hand and, dried, they are ground into meal. About the Caribbean the commonest native names are "guama" or "guaba"; in the *Quechua* country the usual name is "pacae." Both pods and leaves are abundant in Peruvian graves, and the pods were modeled both in the Mochica and Chimu pottery.

Malpighiaceae.—Species of *Byrsonima*, *Malpighia*, and *Bunchosia* are grown for their fleshy and often somewhat acid fruits. Locally, they are most commonly known as "cerezo," "manzanita," or "ciruela." In Central America the probably *Mayan* name "nanche" is commonly used. Some of these tropical shrubs yield a tarter fruit than do most tropical plants and, poor as they are, give an appreciated change.

Anacardiaceae.—The cashew or caju (*Anacardium occidentale*), became known from Brazil, though it is now quite widely distributed in many parts about the Caribbean. It is not known whether it existed in any of the areas of high culture. Its association is probably with the tribes of the Tropical Forests, especially the Amazonian area. The fruit is the cashew nut which must be roasted before becoming edible;

the cashew apple is the juicy peduncle that partially encloses the fruit, and it has served both as a fresh fruit and a source of wine.

The genus *Spondias* is in uncertain classification. Following Standley, *S. purpurea*, the purplish-flowered, scrubby, sprawling species is the better form more commonly grown for its pleasantly acid red and yellow fruits, undoubtedly the "ciruela" de Nicaragua of Cobo's account. The arborescent species of the yellow flowers and coarser fruit, then, is *S. mombin* or *lutea*, the hog plum of the West Indies. It, however, is also often planted, and there are superior strains of local reputation. It, probably, is the "hobo" or "jobo" of early accounts from the West Indies and the mainland. The *Nahua* term "jocote" is applied through Central America to both. The common Spanish term is simply "ciruela," and if a fruit is called a plum in the Tropics it is likely to be a *Spondias*, unless it happens to be a shrub of the *Malpighia* family. Both species of *Spondias* are commonly planted from cuttings, the small one often used to enclose fields. Both species are quite drouth-resistant and are very common in the *Aw* lands of Central America and México, constituting one of the most characteristic elements of the scene in native villages.

Bombacaceae.—*Matisia cordata* is a common fruit tree in the hot valleys of Colombia and Ecuador. Its leathery-skinned, sweet fruit has a slight resemblance to the true sapote, and in some fashion that has become its popular name, resulting in some confusion to the visitor and to the literature.

Guttiferae.—The mamey (*Mammea americana*) is grown for the most part to the north of the Equator. It was praised by Oviedo as the best fruit found in Haiti, but he thought the island mameys much inferior in quality and size to those on the mainland. Especially the Pacific Coast of Panamá and Nicaragua and northern Honduras were credited by him with superior fruit. Cobo, for his part, singled out the mameys of Cartegena and of Sonsonate as the best races of this fruit. Therefore, a fair amount of pre-White horticultural selection seems to have taken place.

The madroño (*Rheedia madruno*) is a common village tree in the warm valleys of northwestern South America. The pleasantly acid fruit is eaten fresh.

Passifloraceae.—Fruits of passion flowers of many kinds are consumed in quantity through most of the tropical latitudes of South America. A very common tropical species is *P. edulis*, of Brazilian origin, the purple-flowered, hard-shelled *granadilla*. In the warm valleys of Colombia and Ecuador, *P. maliformis* is grown for a similar fruit. From early times the *granadillas de Quijos*, from a once flourishing Indian land on the east slope of the Andes in Ecuador, have been noted for their quality; these are probably the species *P. popenovii*.

The giant tumbo of northern Perú, called "badea" in Ecuador and Colombia, is *P. quadrangularis.* It also is restricted to warm climates and is of very different appearance from the preceding, bearing delicate-skinned fruits a foot long. A characteristic form of the temperate zone in the northwestern Andes is *P. ligularis*, the *apincoya* of Cobo (Cobo devotes bk. 5, chs. 12–15, to accounts of several species). The higher altitudes of the northern Andes have a number of species that are grown for fruit and flower, commonly called "tacso" or "curubo": here may be mentioned *P. mollisima* and *pinnati-stipulata.* (Popenoe (1924) has given much study to the fruiting passion flowers and has presented a good summary.)

Caricaceae.—The papaya (*Carica papaya*) appears to be a late prehistoric immigrant into the high cultures of México and Perú: (1) There is neither a *Nahua* nor a *Quechua* name for it. (2) There is no certain archeological knowledge of it in Perú. The general name is of uncertain origin, possibly *Arawak*, and has not penetrated to the remoter parts of México where it is commonly designated by the bastard name "melón zapote." On the other hand, from the *Maya* south through Central America there are native names. Oviedo is positive in his assertion that it was first encountered by the Spaniards in Panamá and designates the "Tierra Firme" beyond Nombre de Diós as the first area in which it was seen, adding that its cultivation was important in Nicaragua and Honduras. Probably, therefore, it is a Central American domesticate associated with *Chorotegan* and *Mayan* culture.

From northern Colombia to northern Chile there is an interesting and poorly known lot of Highland cultivated species. These are generally reduced in size of trunk, fruit, and leaf, and the majority are eaten only after cooking. Here belongs the mito of the Peruvian Andes (*Carica candicans*). A number of species, all of which bear local Indian names, are very common through the Highland settlements of Ecuador and Colombia and well into the tierra fría. Popenoe (1924, pp. 126–127) describes and illustrates three of them: (1) *C. candamarcensis* growing to 3,000 m. (about 9,750 ft.) and reported by him as wild in Loja; (2) *C. pentagona*, to 3,000 m., usually seedless and only known in cultivation, and (3) *C. chrysopetala.*

Myrtaceae.—All of the New World species are poorly known as to the age and extent of their cultivation. Fruits called "arrayan" are widely eaten and used in refrescos from temperate Perú up to central México and in part belong to the species *Myrtus arrayan* or *foliosa.* From eastern South America, the Surinam or Cayenne cherry (*Eugenia uniflora*) has been spread rather widely through the Tropics. (Is this also the "pitanga" of Brazil?)

The guayaba (*Psidium guajava*) is corrupted in English to guava (which in Spanish America is applied to *Inga.*) There is no question that swine and cattle have spread largely the range of this fruit. Oviedo says that it existed in the islands and in "Tierra Firme" in red, rose, and white-fleshed forms, that it was commonly planted by the Indians, and that the wild fruits were smaller than the cultivated ones. It has native names in abundance from México to Perú. There are frequent references throughout this range of territory to superior kinds of guayabas, and it is safe to assume that this heavily yielding fruit is of ancient cultivation in the tropical and temperate areas of high culture.

Sapotaceae.—*Achras zapota* is most properly called "chiclezapote," by mistake "chico zapote," and hence further corrupted into "sapotilla" or "sapodilla." In northern South America and in Central America it may be known under the Spanish name of the European medlar, "níspero." The tree is indigenous to Yucatán and tropical Guatemala, where it is an important source of chicle. It spread of old, however, as a fruit tree yielding heavily its harvest of egg-sized, very sweet fruits. The tree is distinctly limited to tropical climates, and its aboriginal spread perhaps was not south beyond Central America.

Calocarpum mammosum is the zapote proper of the *Nahua*. Its popular names also have become much confused. Southward in Central America it is known as "mamey zapote," i. e., zapote that resembles a mamey, as "mamey colorado," and even as "níspero," further distorted in British colonies into naseberry. Its original home probably is southern México and northern Central America. Oviedo said that it was especially proper to the *Chorotegan* Indians, and he also knew it in Honduras. The fruit grows to a diameter of 15 cm., the salmon-red flesh including often only a single large seed. The seed is ground and mixed with cacao. It also is restricted to full tropical climates.

The closely related genus *Lucuma* in its species *L. obovata* has provided one of the commonest motifs of Peruvian archeology (Yacovleff and Herrera, 1934–35), and though of poor quality is widely grown in the warm valleys of the northern Andes. Popenoe (1924, p. 131) thinks it may be indigenous to the Oriente of Ecuador. There probably exist other cultivated species of *Lucuma*.

Pouteria caimito may be of aboriginal cultivation. It is known as "abiu" in Brazil, "cauje" in Ecuador, and "caimo" in Colombia. Its diffusion may have been effected by Amazonian tribes between the east and west coasts of tropical South America.

Chrysophyllum cainito is the common caimito or star-apple found all about the Caribbean, but not of old extending far beyond.

COTTON

Aboriginal cultivation of cotton extended from the *Hopi* and the Río Grande pueblos of New Mexico to Central Chile, Tucumán, and Paraguay. Latcham (1936 b, p. 223) gives particulars of its cultivation at the time of the Conquest of Chile and includes the valleys of Copiapó, Coquimbo, and Aconcagua, far to the south of the present-day limits. Acosta noted the importance of cotton growing in Tucumán, Santa Cruz de la Sierra, and Paraguay (1590, p. 165; also the relevant areas in Jiménez de la Espada, 1881–97, vol. 3). Only in North America did the limits of its cultivation fall significantly short of the areas climatically suited. (It may be noted, however, that archeologically cotton is known from the high Colorado Plateau, such as Tsegi Canyon in northern Arizona.) There were, of course, the parts of Brazil occupied by *Ge* tribes of rudimentary agriculture or of none at all. Predominantly a crop of the hot lowlands, its cultivation extended also into intermediate altitudes where there were suitable warm sunny valleys (e. g., north of Otavalo in Ecuador the people of Las Salinas were noted for their cotton, Jiménez de la Espada, 1881–97, 3:116).

Andean populations were supplied with cotton in quantity from both flanks of the Andes. In the arid Coastal lowlands much cotton was grown by irrigation. In both *Inca* and pre-*Inca* Coastal sites there is found, in addition to the cotton textiles, a good deal of cotton in the seed (both the large naked and tufted seeds, probably *barbadense* at Ocucaje, for instance). On the eastern flank the yungas of the Antisuyo were noted producers, as were, farther north, the Chachapoyas-Moyobamba and Quijos-Canela regions. In aboriginal Venezuela the district of Tocuyo produced coarse cotton piece goods, from which the name "tocuyo" passed into wide Spanish usage for coarse cotton cloth (Latcham, 1936 b, p. 223). Very fine thread is found in Peruvian textiles; at the other extreme twine and cordage were made from cotton; especially in areas lacking the coarser fibers of cabuya and maguey. The natural fiber colors, white, tawny brown, red, and green are known. Seeds were not generally used for food, but had medicinal uses. Soares de Souza, referring especially to the Bahia region (1851, ch. 62), however, noted that "the natives eat the seeds of cotton crushed and thereafter cooked, making thereof a porridge called mingáu."

The classification of cottons has been put into order only in the last 20 years, the beginning being made by Russian studies, but the major work carried through by scientists of the British Empire Cotton Growing Corporation, based especially in India and Trinidad. A general genetic classification and thesis of origin and diffusion was presented by Harland (1939), followed by the more definite work of Hutchinson, Silow, and Stephens (1947). Important contributions to the origin of New World cotton were made also by the American Beasley (1940) and the Peruvian Boza Barducci. The result has been to reduce very greatly the number of species of cotton, and to discard numerous criteria previously used in classifying them. The valid phenotypic distinctions are so different from those applied by prior taxonomic studies that the earlier published determinations and herbarium labels can be accepted only after reexamination. I know no genus of cultivated plants in which the species and forms are as commonly mistaken, yet no genus is now more satisfactorily known as to origin and differentiation.

The distinction between annual herbaceous and perennial woody cottons now appears to be minor. Both in the New and the Old World the cottons grown before the industrial revolution were mainly perennials, annual forms making their appearance where seasons did not admit of perennial habit. In higher latitudes, with long summer days, an annual, more herbaceous form tended to replace the perennial form. Where winter cold was encountered, only the annual forms, it appears, could exist. In the polar parts of the range, therefore, annual forms should have prevailed, and it is from such margins probably that our sea island and upland cottons were selected. Early historical references to annual cottons in the New World are curiously wanting. Oviedo has a somewhat obscure statement that for best results annual planting and harvesting was practiced on the Caribbean mainland. For tropical latitudes old historical statements referring to cotton as growing on trees are likely to mean precisely that. Soares de Souza even speaks of cotton orchards in Bahia. In older writings shrubby habit may be referred to by comparison with the growth of quince or elder.

Geographically, there are two large species of New World cultivated cottons: *Gossypium barbadense*, and *G. hirsutum*. Genetically, there is a third, *G. tomentosum*, endemic to Hawaii, which is "genetically further removed from *G. hirsutum* than *G. hirsutum* is from *G. barbadense*" (Hutchinson et al., 1947, p. 99).

There is no technical difficulty about crossing the *barbadense* and *hirsutum* groups, but natural crosses are rare and do not persist. Harland calls attention to the custom followed by Indians on the Caribbean mainland, that of mixed planting of *barbadense* and *purpurascens*, adding that where these grow "side by side in cultivation in approximately equal numbers, there is little evidence of connecting forms." Such chance hybrids do not appear to have the capacity of competing with the plants of either species and shortly are eliminated. The division between the two groups is clear and ancient.

With regard to *barbadense* the situation has been well clarified. Here belong Peruvian, some woody Brazilian cottons, and the annual sea island and Egyptian cottons. Its aboriginal range included the West Indies, the Caribbean mainland, Coastal Perú, and the Brazilian lowlands. Information is still needed as to what cotton was grown in the extratropical parts of South America. In its most ordinary form, that of a vigorously branching shrub, *barbadense* is restricted to low latitudes (short-day habit). How and where the long-day (annual) forms, such as sea island, were established, are not known. Was there an annual *barbadense* in southern South America and another in the West Indies? Harland favors the Cauca Valley as place of origin, because of the massing of dominant genes which he noted there. Hutchinson et al. (1947), on the basis of further collections, emphasize the great variability of *barbadense* forms for the west coast area, and hold its variety *brasiliense* to have been developed by the inhabitants of moist forests in Brazil. Prehistorically, the *barbadense* complex appears to have been almost wholly South American, meeting the North American *hirsutum* complex only in lower Central America and in the West Indies.

G. hirsutum in the large sense extended aboriginally from the Colorado Plateau at the north (archeologic) southward along the Pacific coast to the Tumbes area of Perú (Boza), across the West Indies and along the northern shores of South America into northeast Brazil (Hutchinson et al., 1947). Its major area was Middle America, both mainland and island, and its South American penetration appears to have been principally from the northern shores southward, and coastwise.

Two main varieties of *G. hirsutum* appear to be well recognized: var. *punctatum*, and var. *marie-galante* (var. *purpurascens* of Harland). The former is chiefly Mexican and Central American, the latter northern South American. The only area in which both are widely associated is in the West Indies. The *punctatum* variety is usually a woody perennial of markedly bushy habit, branching from the base, with the small bolls setting in the dry season. The forms known to me are markedly xerophytic in habit, the dooryard cottons of México and Guatemala, but Hutchinson reports also a mesophytic type in Central America. The lint most commonly adheres to the seed, but there are tufted and naked seeded forms. The variety *marie-galante*, restricted to lower latitudes, is markedly photoperiodic, flowering only during the shorter days, and in growth is the largest of the cottons, often a small tree, with one branching trunk. The third recognized variety of *G. hirsutum* is annual, herbaceous, and has become the great upland cotton of modern commerce. It is probably the latest of the cotton cultigens; older historical references to it are nearly lacking. Apparently it came from the highlands of southern México, but how and when remains uncertain.

The genus is widely distributed about the dry tropical margins of the world, its sections morphologically, cytologically, and geographically clearly distinct, an indication of their geologic antiquity. All the certainly wild species are diploids and lintless, and all the American wild ones form a single cytologic group. The Old World has two lint-bearing cultivated diploid species, for which Hutchinson et al. (1947, pp. 65–70) have developed the argument that these were formed as fiber plants by the intervention of man.

The New World lint-bearing cottons (including the Hawaiian *G. tomentosum*) are tetraploids and are the only tetraploids in the genus. Moreover they are allotetraploids, consisting of the genom common to all American species, plus the genom of the Old World cultivated species. They are, therefore, of hybrid origin, probably constituted by the fertilizing of lint-bearing Old World female parents by a wild New World male plant. This male parent may well have been *G. raimondii* of North Perú, which species has a restricted range along arroyos in the Pacific base of the Andes and extending out across the coast plain, roughly the area occupied by the Mochica and Chiioú cultures. It is a vigorous, handsomely flowering shrub with larger flowers than any other wild *Gossypium*, and it looks more like the domesticated cottons than any of the wild species, is unique in having seed hairs, and is at home in the middle of one of the major archeologic centers of the New World, an area of remarkable diversity of cultivated plants and wild relatives. (Reference again is made to the excellent monograph of Boza Barducci and Madoo, 1941.)

There are further interesting occurrences of tetrapoid cottons in the Pacific Islands. A supposedly endemic cotton in Tahiti and other Polynesian Islands has been found by Hutchinson et al. (1947, p. 43) to be indistinguishable from the xerophytic "algodon brujo" of Puerto Rico, a form of the *punctatum* variety. The endemic cotton of the Galápagos has been reduced to a variety of *G. barbadense*. The shrubby, endemic cotton of the Hawaiian Islands remains as a tetrapoid species, having the genom of the New World cottons and the one of the Old World cultivated cottons. It may be an early divergent from the ancestral hybrid cotton of the South American mainland, carried to Hawaii before the *barbadense* and *hirsutum* species formed. No tetraploid cottons exist anywhere else in the world, and the whole lot has a common origin. How then, may we explain the connection between Perú, the Marquesas, and Fiji, with no such cottons existing west of Fiji?

The situation is complicated still further by the discovery that in all 26 chromosome cottons there is one Asiatic and one New World genome. The 26 chromosome group is therefore considered as having arisen by the combination of a 13-chromosome Asiatic with a 13-chromosome American ancestor. No 26-chromosome species being on the continents of the Old World, the following, therefore, appear to be implicit: (*a*) The migration of an Asiatic cotton to the New World, (*b*) the forming of a new (26-chromosome) group in the New World, (*c*) the extinction of the immigrant Asiatic parent (there being no 13 diploid *Gossypium* of the Asiatic forms in the New World), and (*d*) finally the dispersal of the new group most of the way west across the Pacific Ocean. Harland (1939) offers an alternative explanation, namely that a land bridge connected America and Asia in low latitudes and that Asiatic and American 13-chromosome *Gossypiums* there met and mingled. The island species therefore would have been left marooned with the collapse of the bridge. Structural geologists have combatted with growing success the readiness of biologists to construct land bridges whenever a troublesome biotic distribution was encountered. A land bridge across the mid-Pacific is one of the unlikeliest things of all unlikely things to have happened in the crustal history of the earth. The land bridge thesis also involves a respectable geological age for the tetraploid cottons far antedating the origins of agriculture and even of man.

The question is raised, therefore, whether 26-chromosome cottons (excepting *hirsutum*) can be considered as truly wild species, the cultivated plants then being simply improved wild ones. There is no question that the cultivated cottons also "grow wild" in the New World. So do limes and oranges. The distinction between originally wild and escaped forms is difficult to establish and has received pitifully little attention from systematists in the field. The usual notations on "wild cotton" are from places where escape is to be expected. Having diagrammed the gene composition of all American and Pacific Island tetraploid species, and noted the high incidence of recessives throughout, Harland states "there is no definite 'wild type' in any of the species" (1939, pp. 172–173). For the present, therefore, the evidence favors considering the American tetraploid cottons as cultigens, and probably also those of the Pacific Islands, even though forms are known that have only short seed hairs.

The cotton genes and chromosomes in their geographic distribution point to a trans-Pacific passage from west to east by an Asiatic parent, and an incompleted return movement of the tetraploid progeny. This is a remarkable dual task to assign to birds, which do not eat *Gossypium* seeds, or to the slight currents of the tropical Pacific, with *Gossypium* being most unsuited to dispersal by floating. A dispersal by land around the North Pacific may have taken place in that remote time when the genus originated. (The thesis of continental drift would provide an avenue from Africa to South America that obviates the problem of a migration through high latitudes.) Neither the way of Alaska nor continental drift could apply to the much later time when the tetraploid group originated. Nor does such a hypothesis help to explain the occurrence of cottons with strong American parentage, ranging from the Galápagos to Fiji. Perforce then we must consider human agencies in the geographic distribution of the *Gossypium* genus. The problem relates entirely to the lint-bearing forms useful to man. At the present state of evidence (and the evidence is varied and much of it precise) there are fewest difficulties in the human explanation. The trial hypothesis then would be that a lint-bearing Oriental cotton (*G. arboreum* ?) was brought from southeastern Asia to the New World (Perú ?). There hybridization took place with an American cotton (*G. raimondii* ?) and the tetraploid series was formed. However, J. O. Beasley (1942, pp. 44–48) comes to the conclusion that the behavior at meiosis "sharply supports the idea that all the natural tetraploid (i. e., 26-chromosome) *Gossypium* species came from one original tetraploid plant."

The immediately preceding paragraphs were written before the publication of the Evolution of Gossypium, in which Hutchinson and his associates present an exceedingly strong case for the origin of all lint-bearing *Gossypium* species at the hands of agricultural folk, and for the introduction by such folk of an Asiatic cotton cross the Pacific into the New World. A new hybrid formed, probably in North Perú, and became differentiated into a South American species (*G. barbadense*) and a Middle American one (*G. hirsutum*). Late archeologic finds have established the presence of cotton in the lowest agricultural (preceramic) horizons of desert Perú and Chile. (See Hutchinson, Silow, and Stephens, 1947.)

MISCELLANEOUS PLANTS

Cacao (*Theobroma cacao*) was a cultivated tree of the Northern Hemisphere, grown throughout the tierra caliente of the Pacific Coast from the Province of Nicoya (Costa Rica) to the Río Grande of Tepic. On the Atlantic side it had a similar latitudinal extent, but its cultivation was in fewer localities and in general less significant. Oviedo's lengthy account of cacao begins with the statement that it was not a tree of the West Indian islands but of the "Tierra Firme," especially of New Spain and of Nicaragua. He describes the manner of its preparation among the *Chorotegan* Indians of Nicoya, but apparently had not seen it south thereof, among the tribes of *Chibchan* speech. His most detailed account of native life is for the Province of Cueva (Panamá), yet he made no mention there of cacao. From the *Chorotega* northward cacao was everywhere an important element in native culture. Southward and eastward, however, it was used little or not at all. This sharp break has nothing to do with climate, nor probably with the native range of the tree.

Selection by aboriginal cultivators resulted in improved types, with fine-flavored, tannin-poor seeds, yielding the fine *criollo* races of the commercial plantations. In addition there was formed in Nicaragua the *lagarto* cacao, so-called because the long, pointed, rough-skinned pods resemble the body of an alligator. This variety, which seems to be a cultigen, carries the botanical name *pentagona.* Its distribution coincides roughly with the old *Chorotegan* land. There is disagreement as to whether the famous Soconusco cacao is botanically distinct. The best present opinion is that all cultivated cacao is of one species. The white-seeded pataste (*Theobroma bicolor*) belongs to Central America and South México, but is probably not to be considered as a cultivated species.

Cacao is the only crop grown between Perú and Sonora for which irrigation is certainly known to have been employed. The principal centers of cultivation lay on the Pacific slope, commonly in small valleys and on cones at the foot slopes of the mountains. Most of these old cacao areas have a limited period of summer rainfall, but the trees require wetting at intervals through most of the year. Characteristically, therefore, water was carried by small ditches through the groves. In general the stubby cacao trees were provided with a canopy of partial shade by interplanting a somewhat taller tree, usually a feathery leafed leguminous tree, such as a *Gliricidia* (madre de cacao). Both irrigation and canopy planting were artifices to simulate the natural habitat of the cacao tree.

In northern South America cacao cultivation was probably introduced by the Spaniards, as the criollo cacao of Venezuela, traced to Franciscan monks who brought seed from Nicoya. Possibly, however, a kind of cacao was grown in the Mérida area of Venezuela before the Conquest. In modern plantations of the West Indies and Venezuela an ordinary or forastero cacao is widely grown, often called 'calabacillo" from the gourdlike shape of its pods. The botanical designation is *leiocarpa;* it is possibly a species but more probably only a variety (freely cross-fertilizing with *criollo* types). This calabacillo cacao has closely related and perhaps truly wild forms widely spread throughout northern South America.

Little is known of the wild cacao and the manner of its domestication. I have not been able to find any satisfactory record of wild cacao in México or Central America or of the distinction between such trees and the *criollo* and *lagarto* forms. It seems impossible to say at present whether the latter had a wild local ancestor or whether they were derived from wild forms in northern South America. The *calabacillo* of South America seems to be more primitive and less specialized than the northern forms. Yet if we suppose that the Central American cacaos were introduced there, we lack all knowledge of a culture that might have brought them from South America. However, in addition to the apparent primitiveness of cacao in northern South America we must regard the favorable climatic conditions widely prevalent there and lacking in Central America. These include, in association, the following: lack of marked dry season, moderate rainfall, little wind, lack of low humidity, tropical temperature values with minimal seasonal and daily range. The habits of the cacao would seem to point to a near-equatorial origin, of less rainfall than is proper to the tropical rain forest. (Good systematic notes on the species are by Kaden, 1935, and Pittier, 1935.)

Coca (*Erythroxylon coca*).—The use of masticatories was very widespread in western and northwestern South America, and it is not possible to distinguish everywhere between the cultivated coca and other species of the genus or plants of other genera, chewed similarly. The use of lime to activate the leaves chewed was general, but in the north precise data on what was chewed are lacking, and in part information about cultivation. It would seem, however, that the use of coca extended through the northern Andes and their adjacent lowlands. Peter Martyr (Anghiera, 1912, Decade 8, bk. 6) cites Dominican monks for an account of growing and chewing what probably was a coca in the Cumaná region of Venezuela. Oviedo described cultivation and chewing of a coca in the country behind Lake Maracaibo, and again its use in old Nicaragua.

An especially important statement on coca is from the pen of the Oidor Juan de Matienzo, about 1567 (1910, chs. 44–51). Beginning his account in Colombia, he speaks of a "coca menuda" in Antioquia, of other plants thus used in the Province of Arma, and in the Provinces of Quimbaya and Anzerma of "arbores medianos tiernos," which always are very green, from which they cut twigs that were chewed against fatigue. In the pueblos subject to Cali and Popayán the coca menuda was used, together with a lime preparation that was kept in small calabashes just as was done, he said, from Venezuela to Quito and Los Charcas (Sucre). (Coca is still cultivated in Indian villages in the Province of Popayán, but otherwise appears to have faded out in the north of South America.) Referring to the area of *Inca* domination, Matienzo continues with a statement of the cultivation of the plant as carried on especially in the warm valley of the Andes from Guamanga to the vicinity of Sucre:

> It is the money of the Indians, and with it they carry on business among themselves; and to ask there should be no coca is to desire that Peru should cease to be and the country given up. [At the time of writing the restriction of use under

> the *Inca* Emperors had given way to a general addiction to coca chewing by the Indians.] Ordinarily it is planted in the same montaña in which the forests had been cut down and burned, by sowing at first in nursery plats after the manner of lettuce beds for the purpose of transplanting, these beds being called *colchas* . . . Here they remain for a year or a year and a half, and in some parts it is better to leave them two years . . . The leaves are gathered three times a year or four times in fourteen months and each harvest is called a *mita* . . . At each harvest it is necessary to cultivate the soil which (?) is called *cora* for it must always be kept clean . . . In order that the coca after picking be not spoiled it must be carried to the sierra without delay.

He emphasized that coca continued to be grown in the plantations that had been made for the *Inca* Emperor, but that a planting boom under the Spaniards had spread to numerous new areas.

The *Inca* rule, puritanical in the handling of its subjects, restricted cultivation to a limited number of carefully managed tracts in the eastern yungas. Before its time perhaps no such stringent rules governed production and use. That this stimulant and narcotic was anciently prized is shown by the bags filled with coca leaves found in the burials of Coastal Perú and by effigy pottery of Nasca and Mochica origin (Yacovleff and Herrera, 1934–35, 3:297). The old use of coca in the coast also indicates an early trans-Andean trade. The situation in aboriginal Colombia also suggests an old and widespread habit of chewing narcotics with the aid of lime.

The habitat of the coca plant is in Andean valleys of the upper tierra caliente, in short-day latitudes. Its ecology appears quite similar to that of cacao, yet culturally the two scarcely overlap. The culture of the masticatories seems to have held a great exclusive terrain in the west and northwest of South America, adjoining that of cacao at the north as it did that of smoking at the east and south.

Bixa orellana takes its generic name from *Arawak* or *Carib*. In Central America the *Nahua* name "achiote" prevails. Its northern area of cultivation coincided well with that of cacao, and here it had an important use in the coloring of drink (chocolate) and food (tamales). Oviedo gives as a reason the Indian liking for blood color; its use in food and drink may at least have had a ritualistic origin. Southward into South America its use was chiefly for face and body painting, which gave satisfaction not only for ceremony and war, but was a protection against insects. No information is at hand as to the distinction between its wild range and the extension by cultivation.

Genipa americana, possibly including other species, is distributed pretty well through the Tropics of America, in part cultivated and in part wild. The fruits are edible and have been used for making an intoxicating drink. Their greatest use, however, was for dyeing the skin black. It is probable that the distribution both of *bixa* and *genipa* was carried into numerous areas beyond their wild range for body painting. Both were used also in dyeing textiles. "Genipapo" is the vernacular Brazilian term derived from the *Tupí;* the West Indian name is "jagua" or "xagua" (descriptive chapters under this name by Oviedo and Cobo).

Indigo was produced from *Indigofera suffruticosa*, the common *añil* of Central America. It appears to have been the main source of blue dyes in native weaving. All the blues in Paracas textiles have been referred to this plant (Yacovleff and Muelle, 1934, 3:156–159). It was grown probably as far south as the Urubamba Valley.

The cultivation of an *Opuntia* cactus for the feeding of cochineal-yielding insects apparently was also spread from México to southern Perú. In the valley of Guamanga this practice is said to have been followed with much care (ibid.).

Crescentia cujete, the more southerly of the two calabash trees, has a distribution from the Antilles to southern Brazil, over nearly 50 degrees of latitude. It was known to the Spaniards about the Caribbean as "hibüera" or "higüera." It is considered by Hartman (1910) as a tree definitely taken under cultivation by the Indians for its excellent gourds.

The pepper tree of Perú (*Schinus molle*) was planted in the *Inca* lands along roads and in towns. It was used in making a strong chicha, for embalming and medicinal purposes. The spread of the *Inca* state apparently caused the diffusion of this tree to areas where it was not native, such as in central Chile (Latcham, 1936 b, p. 53). The other commonest shade tree of Andean lands is a single species of willow (*Salix humboldtiana*) which was noted by early Spanish conquerors from Colombia to Chile, planted about the fields and settlements, and probably carried southward from northwest South America.

In varying degrees, Indian settlements used enclosures, ranging from the formidable stockades surrounding compounds among the *Chibcha*, to living fences protecting garden plots. Various plants were used for such purposes, especially if they had some additional utility. Here may be mentioned *Yucca elephantipes* in Central America, the flowers of which are an important food and which is said to be unknown wild. From México to northern South America species of terrestrial *Bromelia* (*B. pinguin* and *B. karatas*) are much planted for their spiny leaves, strong fiber, and abundant acid fruits. In the lowlands of Colombia and Ecuador the guadua (*Guadua angustifolia*), a giant American bamboo, was used for stockades and construction. Possibly some of the great clumps of it that are to be seen in these lowlands, often far removed from each other, date back to Indian plantings. This giant grass, except for food, was almost as varied in its uses as is bamboo in the Orient, and attracted the attention of the early Spanish recorders. Curiously, it seems not to have been carried beyond northwestern South America.

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Acosta, 1590; Ames, 1939; Anderson, 1943; Anderson and Cutler, 1942; Anghiera, 1912; Avery (see Goodspeed and Avery, 1939); Beasley, 1942; Bois, 1927–28; Boza Barducci and Madoo, 1941; Bukasov, 1930, 1933; Cameron (see Mangelsdorf and Cameron, 1942); Candolle, 1912; Cieza de León, 1932; Cobo, 1893; Collins, 1930; Cook, O. F., 1901, 1910, 1925; Cutler (see Anderson and Cutler, 1942); Ditmers, Ivanov, and Popova, 1937; Engler, 1902, 1920; Friederici, 1926; Garcilaso de la Vega, 1609 and 1619; Gentry, 1942; Gilmore, 1931; Goodspeed and Avery, 1939; Harland, 1939; Hartman, 1910; Henriquez Ureña, 1938; Hernández, 1942; Herrera (see Yacovleff and Herrera, 1934–35), 1921, 1934, 1942; Hoehne, 1937; Hutchinson, Silow, and Stephens, 1947; Ivanov (see Ditmers, Ivanov, and Popova, 1937), 1937; Jiménez (see Popenoe and Jiménez, 1921); Jiménez de la Espada, 1881–97; Kaden, 1935; Latcham, 1936 b; Lenz, 1904–10; Mackie, 1943; Madoo (see Boza Barducci and Madoo, 1941); Maldonado (see Valdizian and Maldonado, 1922); Mangelsdorf and Cameron, 1942; Mangelsdorf and Reeves, 1939; Martyr (see Anghiera, 1912); Matienzo, 1910; Muelle (see Yacovleff and Muelle, 1934); Oviedo y Valdés, 1851–55; Pachano (see Popenoe and Pachano, 1922); Parodi, 1935; Pittier, 1935; Poma de Ayala, 1936, 1939; Popenoe, 1921, 1924; Popenoe and Jiménez, 1921; Popenoe and Pachano, 1922; Popova (see Ditmers, Ivanov, and Popova, 1937); Reeves (see Mangelsdorf and Reeves, 1939); Safford, 1917 a, 1917 b, 1925; Soares de Souza, 1851; Standley, 1920–26, 1928, 1937–38; Thevet, 1558; Tioutine, 1935; Valdizán and Maldonado, 1922; Vargas, 1936, 1938; Whiting, 1939; Xesspe (see Poma de Ayala, 1936); Yacovleff, 1933; Yacovleff and Herrera, 1934–35; Yacovleff and Muelle, 1934.

BIBLIOGRAPHY TO VOLUME 6

ABBREVIATIONS

A. B. C.	A. B. C. Quibdó, Colombia.
Abhandl. Anthrop. Ethnol. Urg.	Abhandlungen zur Anthropologie, Ethnologie und Urgeschichte. Frankfurt, Germany.
Abhandl. Math.-Physik. Cl. K. Bayer. Akad. Wissen. Munich.	Abhandlungen der Mathematisch-Physikalischen Classe der Königlich Bayerischen Akademie der Wissenschaften. Munich, Germany.
Abhandl. Philos.-Philol. Hist. Cl. Akad. Wissen. Munich.	Abhandlungen der Philosophisch-Philologische und Historische Classe der Akademie der Wissenschaften. Munich, Germany.
Acta Amer.	Acta Americana. Revista de la Sociedad (Sociedade) Interamericana de Antropología y Geografía; Review of the Inter-American Society of Anthropology and Geography.
Actas Acad. Nac. Cienc. Córdoba	Actas de la Academia Nacional de Ciencias. Córdoba, Argentina.
Actes Soc. Linn. Bordeaux	Actes de la Société Linnéenne de Bordeaux.
Actes Soc. Sci. Chili	Actes de la Société Scientifique du Chili. Santiago de Chile.
Agriculture in the Americas	Agriculture in the Americas, Office of Foreign Agricultural Relations, U. S. Department of Agriculture. Washington, D. C.
Akad. Nauk S. S. S. R.	Akademii͡a Nauk S. S. S. R. Leningrad, Russia.
Amer. Anthrop.	American Anthropologist.
Amer. Antiq.	American Antiquity.
Amer. Bib. Soc.	American Bible Society. New York, N. Y.
Amer. Comm. Inter. Wild Life Protect. Spec. Publ.	American Committee for International Wild Life Protection. Special Publication.
Amer. Hist. Record	American Historical Record. Philadelphia, Pa.
Amér. Indíg.	América Indígena. México, D. F.
Amer. Journ. Phys. Anthrop.	American Journal of Physical Anthropology.
Amer. Journ. Physiol.	American Journal of Physiology. Baltimore, Md.
Amer. Journ. Sci.	American Journal of Science. New Haven, Conn.
Amer. Journ. Sci. Arts	American Journal of Science and Arts.

Amer. Journ. Surg.	American Journal of Surgery. New York, N. Y.
Amer. Journ. Trop. Med.	American Journal of Tropical Medicine. Baltimore, Md.
Amer. Med. Assoc.	American Medical Association.
Amer. Mus. Nat. Hist.	American Museum of Natural History. New York, N. Y.
Amer. Natur.	American Naturalist.
América	América, Publicación trimestral del Grupo América (revista . . . ilustrada de literatura, arte, ciencias). Quito, Ecuador.
An. Acad. Nac. Agron. Vet.	Anales de la Academia Nacional de Agronomía y Veterinaría. Buenos Aires, Argentina.
An. Facul. Med.	Anales de la Facultad de Medicina, Universidad Mayor de San Marcos. Lima, Peru.
An. Gimn. Paraguayo	Anales del Gimnasio Paraguayo. Asunción, Paraguay.
An. Hydrogr. Mar. Chile	Anuario Hydrográfico de la Marina de Chile. Santiago de Chile.
An. Inst. Etnogr. Amer.	Anales del Instituto de Etnografía Americana, Universidad Nacional de Cuyo. Mendoza, Argentina.
An. Instr. Públ. Estad. Unid. Colombia.	Anales de la Instrucción Pública en los Estados Unidos de Colombia. Bogotá, Colombia.
An. Med. Int. Madrid	Anales de Medicina Interna. Madrid, Spain.
An. Mus. Arg. Cienc. Nat.	Anales del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia." Buenos Aires, Argentina.
An. Mus. La Plata	Anales de Museo de La Plata, Universidad Nacional. La Plata, Argentina.
An. Mus. Nac. Arqueol. Hist. Etnol.	Anales del Museo Nacional de Arqueología, Historia y Etnología. México, D. F.
An. Mus. Nac. Buenos Aires	Anales del Museo Nacional de Buenos Aires. Buenos Aires, Argentina.
An. Mus. Nac. Chile	Anales del Museo Nacional de Historia Natural. Santiago de Chile.
An. Mus. Nac. Hist. Nat. Buenos Aires.	Anales del Museo Nacional de Historia Natural de Buenos Aires. Buenos Aires, Argentina.
An. Soc. Cient. Argentina	Anales de la Sociedad Científica Argentina. Buenos Aires, Argentina.
An. Soc. Geogr. Hist. Guatemala	Anales de la Sociedad de Geografía e Historia de Guatemala. Guatemala, Guatemala.
An. Univ. Cent. Quito	Anales de la Universidad Central. Quito, Ecuador.
An. Univ. Cent. Venezuela	Anales de la Universidad Central de Venezuela. Caracas, Venezuela.

An. Univ. Chile	Anales de la Universidad de Chile. Santiago de Chile.
An. Univ. Nariño	Anales de la Universidad de Nariño. Pasto, Colombia.
Ann. Acad. Brasil. Scienc.	Annaes da Academia Brasileira de Sciencias. Rio de Janeiro, Brazil.
Ann. Bibl. Nac. Rio de Janeiro	Annaes da Bibliotheca Nacional. Rio de Janeiro, Brazil.
Ann. Carnegie Mus. Pittsburgh	Annals of the Carnegie Museum. Pittsburgh, Pa.
Ann. Hyg. Publ. Méd. Lég.	Annales d'Hygiène Publique et de Médicine Légale.
Ann. Ling. Paris	Année Linguistique, Société Philologique. Paris, France.
Ann. Mag. Nat. Hist.	Annals and Magazine of Natural History. London, England.
Ann. Med. Hist.	Annals of Medical History. New York, N. Y.
Ann. Missouri Bot. Garden	Annals of the Missouri Botanical Garden.
Ann. N. Y. Acad. Sci.	Annals of the New York Academy of Sciences.
Ann. Rep. Peabody Mus. Archaeol. Ethnol. Harvard Univ.	Annual Report of the Peabody Museum of Archaeology and Ethnology, Harvard University. Cambridge, Mass.
Ann. Rep. Smithsonian Inst.	Annual Report of the Smithsonian Institution. Washington, D. C.
Ann. Rep. U. S. Nat. Mus.	Annual Report of the United States National Museum, Smithsonian Institution. Washington, D. C.
Anthrop. Pap. Amer. Mus. Nat. Hist.	Anthropological Papers of the American Museum of Natural History. New York, N. Y.
Anthrop. Publ. Univ. Pennsylvania Mus.	Anthropological Publications, The University Museum, University of Pennsylvania. Philadelphia, Pa.
Anthrop. Rev.	Anthropological Review. London, England.
Anthropos	Anthropos. Revue Internationale d'Ethnologie et de Linguistique; Ephemeris Internationalis Ethnologica et Linguistica; International Zeitschrift für Völker- und Sprachenkunde. Salzburg and Vienna, Austria.
Anz. Akad. Wissen. Wien	Anzeiger der Akademie der Wissenschaften in Wien.
Archiv Anthrop.	Archiv für Anthropologie. Brunswick (Braunschweig), Germany.
Archiv. Antrop. Etnol.	Archivio per l'Antropologia e l'Etnologia. Florence, Italy.
Archiv. Chil. Morf.	Archivos Chilenos de Morfología. Santiago de Chile.
Archiv. Med. Leg. Ident.	Archivos de Medicina Legal e Identificação. Rio de Janeiro, Brazil.

Archiv. Mus. Nac. Rio de Janeiro.	Archivos do Museu Nacional. Rio de Janeiro, Brazil.
Archiv. Path.	Archives of Pathology. Chicago, Ill.
Archiv Path. Anat. Phys. Klin. Med.	Archiv für Pathologische Anatomie und Physiologie und für Klinische Medizin. Berlin, Germany.
Archiv. Path. Lab. Med.	Archives of Pathology and Laboratory Medicine. Chicago, Ill.
Archiv Rassen- Gesell.-Biol.	Archiv für Rassen- und Gesellschafts-Biologie, einschliesslich Rassen- und Gesellschaftshygiene. Berlin; Munich.
Arquiv. Inst. Benjamin Baptista	Arquivos de Instituto Benjamin Baptista. Rio de Janeiro, Brazil.
Arquiv. Mus. Nac. Rio de Janeiro	Arquivos do Museu Nacional. Rio de Janeiro, Brazil.
Art and Archaeology	Art and Archaeology; the Arts Throughout the Ages. Archaeological Institute of America. Baltimore; Washington.
Assoc. Franç. Avanc. Sci.	Association Française pour l'Avancement des Sciences. Paris, France.
Atti Accad. Med. Roma.	Atti della Accademia di Medicina di Roma. Rome, Italy.
Atti Soc. Rom. Antrop.	Atti della Società Romana di Antropologia. Rome, Italy.
Ausland	Ausland. Stuttgart, Germany.
Azul	Azul; Revista de Ciencias y Letras. Azul, Argentina.
Baessler-Archiv	Baessler-Archiv, Beitrage zür Völkerkunde. Leipzig and Berlin, Germany.
Behavior Monog.	Behavior Monographs. Baltimore, Md.
Bibl. Ling. Amér. Paris	Bibliothèque Linguistique Américaine. Paris, France.
Bibl. Ling. Mus. La Plata	Biblioteca Lingüística del Museo de La Plata. La Plata and Buenos Aires, Argentina.
Bibl. Pedag. Brasil.	Biblioteca Pedagogica Brasileira. São Paulo and Rio de Janeiro, Brazil.
Bibl. Soc. Cient. Paraguay	Biblioteca de la Sociedad Científica del Paraguay. Asunción, Paraguay.
Bol. Acad. Arg. Let.	Boletín de la Academia Argentina de Letras. Buenos Aires, Argentina.
Bol. Acad. Nac. Cienc. Córdoba.	Boletín de la Academia Nacional de Ciencias. Córdoba, Argentina.
Bol. Acad. Nac. Hist. Quito	Boletín de la Academia Nacional de Historia. Quito, Ecuador.
Bol. Acad. Venezolana	Boletín de la Academia Venezolana. Caracas, Venezuela.
Bol. Arqueol. Bogotá	Boletín de Arqueología. Bogotá, Colombia.
Bol. Bibl. Antrop. Amer.	Boletín Bibliográfico de Antropología Americana, Instituto Panamericano de Geografía e Historia. México, D. F.

Bol. Comm. Geogr. Geol. São Paulo	Boletim da Commissão Geographica e Geologica do Estado de São Paulo.
Bol. Estud. Hist. Pasto	Boletín de Estudios Históricos. Pasto, Colombia.
Bol. Fac. Filos. Ciênc. Let. Univ. São Paulo.	Boletim do Faculdade de Filosofía, Ciências e Letras, Universidade de São Paulo. São Paulo, Brazil.
Bol. Filol. Montevideo	Boletín de Filología, Sección de Filología y Fonética Experimental, Instituto de Estudios Superiores, Universidad de Montevideo. Montevideo, Uruguay.
Bol. Hist. Antig.	Boletín de Historia y Antigüedades. Bogotá, Colombia.
Bol. Inst. Geogr. Argentino	Boletín del Instituto Geográfico Argentino. Buenos Aires, Argentina.
Bol. Inst. Invest. Hist. Buenos Aires	Boletín del Instituto de Investigaciones Históricas. Buenos Aires, Argentina.
Bol. Min. Agric. Colon. Bolivia	Boletín del Ministerio de Agricultura y Colonización. La Paz, Bolivia.
Bol. Min. Agric. Indúst. Com.	Boletim do Ministério da Agricultura, Indústria e Comércio. Rio de Janeiro, Brazil.
Bol. Mus. Goeldi	Boletim do Museu Paraense Emilio Goeldi de Historia Natural e Ethnographia. Belém do Para, Brazil.
Bol. Mus. Hist. Nat. "Javier Prado"	Boletín del Museo de Historia Natural "Javier Prado," Universidad Mayor de San Marcos. Lima, Peru.
Bol. Mus. Hist. Nat. Lima	Boletín del Museo de Historia Natural, Universidad Mayor de San Marcos. Lima, Peru.
Bol. Mus. Nac. Chile	Boletín del Museo Nacional de Historia Natural. Santiago de Chile.
Bol. Mus. Nac. Rio de Janeiro	Boletim do Museu Nacional de Rio de Janeiro. Rio de Janeiro, Brazil.
Bol. Ofic. Nac. Estad. La Paz	Boletín de la Oficina Nacional de Estadística. La Paz, Bolivia.
Bol. Soc. Biol. Concepción	Boletín de la Sociedad de Biología de Concepción. Concepción, Chile.
Bol. Soc. Cienc. Nat. Inst. La Salle	Boletín de la Sociedad de Ciencias Naturales del Instituto de la Salle. Bogotá, Colombia.
Bol. Soc. Ecuatoriana Estud. Hist. Amer.	Boletín de la Sociedad Ecuatoriana de Estudios Históricos Americanos. Quito, Ecuador.
Bol. Soc. Geogr. La Paz	Boletín de la Sociedad Geográfica de la Paz. La Paz, Bolivia.
Bol. Soc. Geogr. Lima	Boletín de la Sociedad Geográfica de Lima. Lima, Peru.
Bol. Soc. Geogr. Sucre	Boletín de la Sociedad Geográfica de Sucre. Sucre, Bolivia.
Bol. Soc. Méd.-Cir. Mil. Rio de Janeiro.	Boletim da Sociedade Médico-Cirurgica Militar. Rio de Janeiro, Brazil.

Bol. Soc. Physis	Boletín de la Sociedad Physis. Buenos Aires, Argentina.
Bol. Soc. Venezolana Cienc. Nat.	Boletín de la Sociedad Venezolana de Ciencias Naturales. Caracas, Venezuela.
Bol. Univ. Madrid	Boletín de la Universidad de Madrid. Madrid, Spain.
Bol. Univ. Nac. Litoral	Boletín de la Universidad Nacional del Litoral. Sante Fe, Argentina.
Boll. R. Accad. Med. Roma	Bollettino della Reale Accademia Medicina di Roma.
Boll. Soc. Geogr. Italiana	Bollettino della Società Geografica Italiana. Rome, Italy.
Bot. Mus. Harvard Univ.	Botanical Museum of Harvard University. Cambridge, Mass.
Brasiliana	(Colecão) Brasiliana, Bibliotheca Pedagógica Brasileira. São Paulo, Brazil.
British Mus. (Nat. Hist.)	British Museum (Natural History). London, England.
Bull. Acad. Impér. Méd.	Bulletin de l'Académia Impériale de Médecine. Paris, France.
Bull. Amer. Ethnol. Soc.	Bulletin, American Ethnological Society. New York, N. Y.
Bull. Amer. Geogr. Soc.	Bulletin, American Geographical Society. New York, N. Y.
Bull. Amer. Mus. Nat. Hist.	Bulletin, American Museum of Natural History. New York, N. Y.
Bull. Appl. Bot. Genet. Plant Breed.	Bulletin of Applied Botany, Genetics, and Plant Breeding. Leningrad.
Bull. Bur. Amer. Ethnol.	Bulletin, Bureau of American Ethnology, Smithsonian Institution. Washington, D. C.
Bull. Bur. Ethnol. Haiti	Bulletin de Bureau d'Ethnologie de la République d'Haiti. Port-au-Prince, Haiti.
Bull. Geol. Soc. Amer.	Bulletin, Geological Society of America.
Bull. Harvard Mus. Comp. Zool.	Bulletin, Harvard Museum of Comparative Zoology. Cambridge, Mass.
Bull. Mém. Soc. Anthrop. Paris	Bulletins et Mémoires de la Société d'Anthropologie de Paris. Paris, France.
Bull. Mém. Soc. Chir. Paris	Bulletins et Mémoires de Société de Chirurgie de Paris. Paris, France.
Bull. Mus. Hist. Nat. Paris	Bulletin du Museum d'Histoire Naturelle. Paris, France.
Bull. N. Y. Zool. Soc.	Bulletin of the New York Zoological Society. New York, N. Y.
Bull. Soc. Amér. Belgique	Bulletin de la Société des Américanistes de Belgique. Brussels.
Bull. Soc. Anthrop. Bruxelles	Bulletin du Société d'Anthropologie de Bruxelles.
Bull. Soc. Anthrop. Paris	Bulletin de la Société d'Anthropologie de Paris. Paris, France.

Bull. Soc. Géogr. Paris	Bulletin de la Société de Géographie. Paris, France.
Bull. Soc. Ling. Paris	Bulletin de la Société de Linguistique de Paris. Paris, France.
Bull. Torr. Bot. Club	Bulletin Torrey Botanical Club. New York, N. Y.
Bull. U. S. Nat. Mus.	Bulletin, United States National Museum, Smithsonian Institution. Washington, D. C.
Caldasia	Caldasia, Boletín del Instituto de Ciencias Naturales de la Universidad Nacional de Colombia. Bogotá, Colombia.
Calif. State Journ. Med.	California State Journal of Medicine.
Cambridge Nat. Hist.	Cambridge Natural History. London, England.
Carnegie Inst. Washington	Carnegie Institution of Washington. Washington, D. C.
Col. Doc. Inéd. Hist. España	Colección de Documentos Inéditos para la Historia de España. Madrid, Spain.
Col. Estud. Indig.	Colección de Estudios Indigenistas, Instituto de Filologia, Facultad de Filosofía y Letras, Universidad Nacional. Buenos Aires, Argentina.
Col. Hist. Chile	Colección de Historiadores de Chile y de Documentos á la Historia Nacional. Santiago de Chile.
Coll. Ling. Amér.	Collection Linguistique Américaine. Paris, France.
Coll. Ling. Paris	Collection Linguistique, Société de Linguistique de Paris. Paris, France.
Com. Mus. Nac. Hist. Nat. Buenos Aires.	Comunicaciones del Museo Nacional de Historia Natural de Buenos Aires.
Comp. Ethnogr. Stud.	Comparative Ethnographical Studies. Gothenburg (Göteborg), Sweden.
Compt.-Rend. Acad. Sci. Paris	Comptes-Rendus, Académie des Sciences. Paris, France.
Compt. Rend. Soc. Biol.	Comptes Rendus, Société de Biologie. Paris, France.
Congr. Cient. Gen. Chil.	Congreso Científico General Chileno.
Congr. Int. Amer.	Congreso Internacional de Americanistas; Congrès International des Américanistes; International Congress of Americanists, etc.
Congr. Int. Anthrop. Archéol. Prehist.	Congrès International d'Anthropologie et d'Archéologie Prehistoriques; International Congress of Anthropology and Prehistoric Archaeology, etc.
Congr. Int. Sci. Anthrop. Ethnol.	Congrès International de Sciences Anthropologiques et Ethnologiques.
Contrib. Mus. Amer. Ind.	Contributions of the Museum of the American Indian, Heye Foundation. New York, N. Y.

Contrib. U. S. Nat. Herb.	Contributions from the United States National Herbarium. Washington, D. C.
Cursos Confer.	Cursos y Conferencias, Revista del Colegio Libre de Estudios Superiores. Buenos Aires, Argentina.
De Re Indica	De Re Indica, órgano de la Sociedad Venezolano de Americanistas. Caracas, Venezuela.
Denk. Math.-Phys. Cl. K. Bayer. Akad. Wissen. Munich.	Denkschriften, Mathematisch-Physikalische Classe, K. Bayerische Akademie der Wissenschaften, Munich.
Denk. Philos.-Hist. Kl. K. Akad. Wissen. Vienna.	Denkschriften der Philosophisch-Historische Klasse der K. Akademie der Wissenschaften, Vienna.
Dent. Cosmos	Dental Cosmos. Philadelphia, Pa.
Diana Rev. Mens. Ilus. Buenos Aires.	Diana, Revista Mensual Ilustrada. Buenos Aires, Argentina.
Early Man	Early Man, as depicted by leading authorities at the International Symposium, The Academy of Natural Sciences, Philadelphia. Philadelphia; London.
El Mon. Educ. Común. Buenos Aires.	El Monitor de la Educación Común, órgano del Consejo Nacional de Educación. Buenos Aires, Argentina.
Ethnol. Abt. König. Mus.	Ethnologische Abteilung des Königlichen Museums. Berlin, Germany.
Ethnol. Stud.	Etnologiska Studier; Ethnological Studies. Gothenburg (Göteborg), Sweden.
Ethnos	Ethnos. Mexico City, Mexico (to 1925); Stockholm, Sweden (1936–).
Field Mus. Nat. Hist. Anthrop. Mem.	Field Museum of Natural History, Anthropological Memoirs. Chicago, Ill.
Field Mus. Nat. Hist. Anthrop. Ser.	Field Museum of Natural History, Anthropological Series. Chicago, Ill.
Field Mus. Nat. Hist. Zool. Ser.	Field Museum of Natural History, Zoological Series. Chicago, Ill.
Gaea	Gaea, Anales de la Sociedad Argentina de Estudios Geográficos. Buenos Aires, Argentina.
Generos	Generos, órgano de la Biblioteca Nacional. Bogotá, Colombia.
Genetica	Genetica, Nederlandsch Tijdschrift voor Erfelijkheids- en Afstammingsleer. 'S Gravenhage (The Hague).
Genetics	Genetics, Brooklyn Botanic Garden. Brooklyn, N. Y.
Geogr. Journ.	The Geographical Journal, Royal Geographical Society. London.
Geogr. Rev.	Geographical Review, American Geographical Society. New York, N. Y.
Geogr. Zeit.	Geographische Zeitschrift. Leipzig, Germany.

Geol. Soc. Amer.	Geological Society of America. New York, N. Y.
Globus	Globus. Brunswick (Braunschweig), Germany.
Göteborgs Kungl. Vet. Vitt. Handl.	Göteborgs kungl. vetenskaps-och vitterhets-samhälles Handlingar. Gothenburg (Göteborg), Sweden.
Harvard Univ. Press.	Harvard University Press. Cambridge, Mass.
Hilgardia	Hilgardia, California Agricultural Experiment Station. Berkeley, Calif.
Human Biol.	Human Biology; a Record of Research. Baltimore, Md.
Humanior	Humanior, Biblioteca del Americanista Moderno. Buenos Aires, Argentina.
Humaniora, Acta Acad. Åboensis	Humaniora, Acta Academiae Åboensis, Åbo Akademi. Åbo, Finland.
Hakluyt	The Hakluyt Society. London, England.
Il Nazionale	Il Nazionale, Revista di Centro Italiano di Studi Americani. Rome; Turín.
Inca	Inca, Revista de Estudios Antropológicos, órgano del Museo de Arqueología de la Universidad Mayor de San Marcos. Lima, Peru.
Ind. Notes	Indian Notes, Museum of the American Indian, Heye Foundation. New York, N. Y.
Ind. Notes Monogr.	Indian Notes and Monographs, Museum of the American Indian, Heye Foundation. New York, N. Y.
Inst. Biol. Univ. Autó. México	Instituto de Biología, Universidad Autónoma de México.
Inst. Etnol. Univ. Nac. Tucumán	Instituto de Etnología de la Universidad Nacional. Tucumán, Argentina.
Inst. Int. Anthrop.	Institut International d'Anthropologie. Paris, France.
Inst. Panamer. Geogr. Hist.	Instituto Panamericano de Geografía e Historia. México, D. F.
Int. Archiv Ethnogr.	International Archiv fur Ethnographie. Leyden, Holland.
Int. Journ. Amer. Ling.	International Journal of American Linguistics. New York; Baltimore.
Jahresber. Geogr. Gesell. Bern	Jahresbericht der Geographischen Gesellschaft zu Bern. Bern, Switzerland.
Jounr. Allied Dent. Soc.	The Journal of the Allied Dental Societies. New York, N. Y.
Journ. Amer. Dent. Assoc.	Journal of the American Dental Association. Chicago, Ill.
Journ. Amer. Dietet. Assoc.	Journal of the American Dietetic Association. Chicago; Baltimore.
Journ. Amer. Folklore	Journal of American Folklore. Boston, Mass.; New York, N. Y.; Lancaster, Pa.

Journ. Amer. Med. Assoc.	Journal of the American Medical Association.
Journ. Amer. Stat. Assoc.	Journal of the American Statistical Association. Boston, Mass.
Journ. Anat. Physiol.	Journal of Anatomy and Physiology. Cambridge and London, England.
Journ. Anthrop. Inst. Gr. Brit. Ireland.	Journal of the Anthropological Institute of Great Britain and Ireland. London, England.
Journ. Anthrop. Soc. London	Journal of the Anthropological Society of London. London, England.
Journ. Clín.	Journal dos Clínicos.
Journ. Ethnol. Soc. London	Journal of the Ethnological Society of London. London, England.
Journ. Genet.	Journal of Genetics. Cambridge, England.
Journ. Hered.	Journal of Heredity. Washington, D. C.
Journ. Immunol.	Journal of Immunology, Society for Serology and Haematology, American Association of Immunologists. Baltimore, Md.
Journ. Inst. Jamaica	Journal of the Institute of Jamaica. Kingston, Jamaica.
Journ. Mamm.	Journal of Mammalogy. Baltimore, Md.
Journ. N. Y. Bot. Garden	Journal of the New York Botanical Garden. New York, N. Y.
Journ. Roy. Anthrop. Inst. Gr. Brit. Ireland.	Journal of the Royal Anthropological Institute of Great Britain and Ireland. London, England.
Journ. Roy. Geogr. Soc.	Journal of the Royal Geographical Society. London, England.
Journ. Soc. Amér. Paris	Journal de la Société des Américanistes de Paris. Paris, France.
Journ. Washington Acad. Sci.	Journal of the Washington Academy of Sciences.
Kosmos	Kosmos, Gesellschaft der Naturfreunde. Stuttgart.
La Brasa	La Brasa, Periódico Mensual de Letras y Artes. Santiago del Estero, Argentina.
L'Anthrop.	L'Anthropologie. Paris, France.
Lasso	Lasso, Deutsch-Südamerikanische Monatschrift. Buenos Aires, Argentina.
Letras	Letras, órgano de la Facultad de Filosofía, Historia y Letras, Universidad Mayor de San Marcos. Lima, Perú.
Man	Man, Royal Anthropological Institute of Great Britain and Ireland. London, England.
Mem. Amer. Anthrop. Assoc.	Memoirs of the American Anthropological Association.
Mem. Conn. Acad. Arts Sci.	Memoirs of the Connecticut Academy of Arts and Sciences. New Haven, Conn.

Mem. Harvard Mus. Comp. Zool.	Memoirs, Harvard Museum of Comparative Zoology. Cambridge, Mass.
Mém. Inst. Ethnol. Paris	Mémoires, Institut d'Ethnologie, Université de Paris. Paris, France.
Mem. Jardín Zool. La Plata	Memorias del Jardín Zoológico. La Plata, Argentina.
Mem. Mus. Paraná	Memorias del Museo de Paraná. Paraná, Argentina.
Mem. Nat. Acad. Sci.	Memoirs of the National Academy of Sciences. Washington, D. C.
Mém. Soc. Anthrop. Paris	Mémoires de la Société d'Anthropologie de Paris. Paris, France.
Mém. Soc. Ling. Paris	Mémoires de la Société de Linguistique de Paris. Paris, France.
Mitt. Anthrop. Gesell. Wien	Mitteilungen der Anthropologische Gesellschaft in Wien. Wien (Vienna), Austria.
Mitt. Verhandl. Internat. Wiss. Lepra-Conf.	Mittheilungen und Verhandlungen d. Internationale Wissenschaftliche Lepra-Conferenz; International Scientific Conference on Leprosy.
Muench. Med. Wochen.	Muenchener Medizinische Wochenschrift. Munich, Germany.
Mus. Journ. Univ. Pennsylvania	Museum Journal, The University Museum, University of Pennsylvania. Philadelphia, Pa.
Nat. Geogr. Mag.	National Geographic Magazine, National Geographic Society. Washington, D. C.
Nat. Hist.	Natural History, The Magazine of the American Museum of Natural History. New York, N. Y.
Naturwiss. Wochen.	Naturwissenschaftliche Wochenschrift. Jena, Germany.
Neue Denkschr. Schweizer. Natur. Gesell.	Neue Denkschriften der Schweizerischen Naturforschenden Gesellschaft. Zürich.
New Mexico Anthrop.	New Mexico Anthropologist. Albuquerque, N. M.
Notas Mus. La Plata	Notas del Museo de La Plata, Instituto del Museo de la Universidad Nacional de La Plata. La Plata, Argentina.
Notas Prelim. Mus. La Plata	Notas Preliminares del Museo de La Plata, Universidad Nacional. La Plata, Argentina.
N. Y. Acad. Sci.	New York Academy of Sciences. New York, N. Y.
Pacif. Dent. Gaz.	Pacific Dental Gazette. San Francisco, Calif.
Pap. Michigan Acad. Sci. Arts Let.	Papers of the Michigan Academy of Science, Arts and Letters. New York, N. Y.
Pap. Peabody Mus. Amer. Archaeol. Ethnol. Harvard Univ.	Papers of the Peabody Museum of American Archaeology and Ethnology, Harvard University. Cambridge, Mass.

Petermanns Mitt.	Petermanns Mitteilungen. Gotha, Germany.
Phil. Trans. Roy. Soc. London	Philosophical Transactions of the Royal Society of London.
Petite Biblio. Amér.	Petite Bibliothèque Américaine. Paris, France.
Physis	Physis, Revista de la Sociedad Argentina de Ciencias Naturales. Buenos Aires, Argentina.
Primitive Man	Primitive Man, Quarterly Bulletin of the Catholic Anthropological Conference. Washington, D. C.
Proc. Acad. Natur. Sci. Philadelphia	Proceedings of the Academy of Natural Sciences of Philadelphia. Philadelphia, Pa.
Proc. Amer. Assoc. Advance. Sci.	Proceedings of the American Association for the Advancement of Science.
Proc. Amer. Philos. Soc.	Proceedings of the American Philosophical Society. Philadelphia, Pa.
Proc. Eighth Amer. Sci. Congr.	Proceedings of the Eighth American Scientific Congress. Washington, D. C.
Proc. Pan-Amer. Sci. Congr.	Proceedings of the Pan-American Scientific Congress.
Proc. Roy. Geogr. Soc.	Proceedings of the Royal Geographical Society. London, England.
Proc. Roy. Soc. Med.	Proceedings of the Royal Society of Medicine. London, England.
Proc. Second Conv. Inter-Amer. Bibl. Libr. Assoc.	Proceedings of the Second Convention of the Inter-American Bibliographical and Library Association.
Proc. Soc. Exp. Biol. Med.	Proceedings of the Society for Experimental Biology and Medicine. New York, N. Y.
Proc. U. S. Nat. Mus.	Proceedings of the United States National Museum. Washington, D. C.
Proc. Washington Acad. Sci.	Proceedings of the Washington Academy of Sciences.
Proc. Zool. Soc. London	Proceedings of the Zoological Society of London.
Przeglad Antropologiczny	Przeglad Antropologiczny, Polskie Towarzystwo Antropologiczne, Posen Universytit (Zaklad Antropologji). Posen.
Publ. Fac. Cienc. Univ. Nac. Litoral, Ser. Téc.-Cient.	Publicaciones de la Facultad de Ciencias de la Universidad Nacional del Litoral, Serie Técnico-Científico. Rosario, Argentina.
Publ. Inst. Fisiog. Geol.	Publicaciones del Instituto de Fisiografía y Geología. Rosario, Argentina.
Publ. Inst. Invest. Hist.	Publicaciones del Instituto de Investigaciones Históricas. Buenos Aires, Argentina.

Publ. Mus. Antrop. Etnogr. Fac. Filos. Letras.	Publicaciones del Museo Antropológico y Etnográfico de la Facultad de Filosofía y Letras, Universidad de La Plata. Buenos Aires, Argentina.
Publ. Mus. Antrop. Lima	Publicaciones del Museo de Antropología. Lima, Peru.
Publ. Mus. Etnol. Antrop. Chile	Publicaciones del Museo de Etnología y Antropología de Chile. Santiago de Chile.
Publ. Real Acad. Hist. Madrid	Publicaciones de la Real Academia de la Historia. Madrid, Spain.
Publ. School Amer. Research, Archaeol. Inst. Amer.	Publication of the School of American Research, Archaeological Institute of America. Santa Fe, N. M.
Publ. Secc. Antrop. Fac. Filos. Let.	Publicationes de la Sección Antropológica de la Facultad de Filosofía y Letras. Buenos Aires, Argentina.
Publ. Secc. Arqueol. Min. Educ. Nac. Colombia.	Publicaciones de la Sección de Arqueología, Ministerio de Educación Nacional. Bogotá, Colombia.
Publ. Univ. Nac. Tucumán	Publicaciones de la Universidad Nacional de Tucumán. Tucumán, Argentina.
Quart. Rev. Biol.	Quarterly Review of Biology. Baltimore, Md.
Rel. Geogr. Indias	Relaciones Geográficas de Indias (Published by Marcos Jiménez de la Espada). Madrid, Spain.
Rel. Soc. Argentina Antrop.	Relaciones de la Sociedad Argentina de Antropología. Buenos Aires, Argentina.
Rep. British Assoc. Advance. Science	Report of the British Association for the Advancement of Science.
Rep. Hist. Medellín	Repertorio Histórico, órgano de la Academia Antioqueña de Historia. Medellín, Colombia.
Rev. Acad. Colombia Cienc. Exact. Fis. Natur.	Revista de la Academia Colombia de Ciencias Exactas, Físicas y Naturales. Bogotá, Colombia.
Rev. Amer. Rio de Janeiro	Revista Americana. Rio de Janeiro, Brazil.
Rev. Anthrop. Paris	Revue d'Anthropologie. Paris, France.
Rev. Archiv. Santiago del Estero	Revista del Archivo de Santiago del Estero. Santiago del Estero, Argentina.
Rev. Argentina Agron.	Revista Argentina de Agronomía. Buenos Aires, Argentina.
Rev. Argentina Paleon. Antrop. Ameghinia.	Revista Argentina de Paleontología y Antropología Ameghinia. Buenos Aires, Argentina.
Rev. Arqueol. Lima	Revista de Arqueología. Lima, Perú.
Rev. Arquiv. Mun. São Paulo	Revista do Arquivo Municipal. São Paulo, Brazil.
Rev. Bibl. Chilena Extran.	Revista de Bibliografía Chilena y Extranjera. Santiago de Chile.

Rev. Bolivia	Revista de Bolivia. La Paz, Bolivia.
Rev. Brasil	Revista Brasileira. Rio de Janeiro.
Rev. Centr. Estud. Hist. Geogr. Cuenca.	Revista del Centro de Estudios Históricos y Geográficos de Cuenca. Cuenca, Ecuador.
Rev. Chilena Hist. Geogr.	Revista Chilena de Historia y Geografía. Santiago de Chile.
Rev. Chilena Hist. Nat.	Revista Chilena de Historia Natural. Santiago de Chile.
Rev. Col. Nac. Benigno Malo	Revista del Colegio Nacional Benigno Malo. Cuenca, Ecuador.
Rev. Crim. Polic. Cient.	Revista de Criminología y Policia Científica. Santiago de Chile.
Rev. Derecho Hist. Let.	Revista de Derecho, Historia y Letras. Buenos Aires, Argentina.
Rev. Entom. São Paulo	Revista de Entomologia. São Paulo, Brazil.
Rev. Ethnogr. Paris	Revue d'Ethnographie. Paris, France.
Rev. Exp. Antrop. Brasil	Revista da Exposição Antropologica Brasileira. Rio de Janeiro, Brazil.
Rev. Fac. Flum. Med.	Revista da Faculdade Fluminense de Medicina. Rio de Janeiro, Brazil.
Rev. Gén. Bot.	Revue Générale de Botanique. Paris, France.
Rev. Geogr. Amer.	Revista Geográfica Americana. Buenos Aires, Argentina.
Rev. Hist. Colombia	Revista de Historia, Centro de Historia de Pasto. Pasto, Colombia.
Rev. Hist. Lima	Revista Histórica, órgano del Instituto Histórico del Perú. Lima, Perú.
Rev. Imig. Col. Rio de Janeiro	Revista de Imigração e Colonização. Rio de Janeiro, Brazil.
Rev. Inst. Antrop. Univ. Nac. Tucumán.	Revista del Instituto de Antropología de la Universidad Nacional de Tucumán. Tucumán, Argentina.
Rev. Inst. Arqueol. Cuzco	Revista del Instituto Arqueológico del Cuzco. Cuzco, Perú.
Rev. Inst. Arqueol. Hist. Geogr. Pernambucano.	Revista do Instituto Arqueológico, Histórico e Geográfico Pernambucano (*also* Instituto Archeológico, Histórico e Geográphico Pernambucano). Pernambuco and Recife, Brazil.
Rev. Inst. Bact. Chile	Revista del Instituto Bacteriológico de Chile. Santiago de Chile.
Rev. Inst. Ceará	Revista do Instituto do Ceará. Fortaleza, Ceará, Brazil.
Rev. Inst. Etnol. Nac. Bogotá	Revista del Instituto Etnológico Nacional Bogotá, Colombia.
Rev. Inst. Etnol. Univ. Nac. Tucumán.	Revista del Instituto de Etnología de la Universidad Nacional de Tucumán. Tucumán, Argentina.

Rev. Inst. Hist. Geogr. Brasil	Revista do Instituto Histórico e Geográphico Brasileiro (*also* Revista trimensal do Instituto Histórico e Geographico do Brasil).
Rev. Inst. Hist. Geogr. Rio Grande do Sul.	Revista do Instituto Histórico e Geográfico do Rio Grande do Sul. Pôrto Alegre, Brazil.
Rev. Inst. Hist. Geogr. São Paulo	Revista do Instituto Histórico e Geographico de São Paulo. São Paulo, Brazil.
Rev. Inst. Hist. Geogr. Uruguay	Revista del Instituto Histórico y Geográfico del Uruguay. Montevideo, Uruguay.
Rev. Jardín Botán. Asunción	Revista del Jardín Botánico. Asunción, Paraguay.
Rev. Jardín Zool. Buenos Aires	Revista del Jardín Zoológico. Buenos Aires, Argentina.
Rev. Ling. Phil. Comp.	Revue de Linguistique et de Philologie Comparée. Paris, France.
Rev. Méd. Barcelona	Revista Médica de Barcelona. Barcelona, Spain.
Rev. Méd. Chile	Revista Médica de Chile, Sociedad Médica. Santiago de Chile.
Rev. Méd Peruana	Revista Médica Peruana. Lima, Perú.
Rev. Men. Sec. Soc. Geogr. Lisboa, Brazil.	Revista Mensual de Secção da Sociedade de Geographia de Lisboa, Brazil. Rio de Janeiro, Brazil.
Rev. Men. Soc. Geogr. Rio de Janeiro	Revista Mensual da Sociedade de Geografia do Rio de Janeiro. Rio de Janeiro, Brazil.
Rev. Mex. Soc.	Revista Mexicana de Sociología, Instituto de Investigaciones Sociales de la Universidad Nacional Autónoma. México, D. F.
Rev. Mis. Colombia	Revista de Misiones. Bogotá, Colombia.
Rev. Mus. Arch. Pub. Rio Grande do Sul.	Revista do Museu e Archivo publico do Rio Grande do Sul. Porto Alegre.
Rev. Mus. Hist. Nac. Chile	Revista del Museo Histórico Nacional de Chile. Santiago de Chile.
Rev. Mus. La Plata	Revista del Museo de La Plata. La Plata, Argentina.
Rev. Mus. Nac. Lima	Revista del Museo Nacional de Lima. Lima, Perú.
Rev. Mus. Nac. Rio de Janeiro	Revista do Museu Nacional. Rio de Janeiro, Brazil.
Rev. Mus. Paul.	Revista do Museu Paulista. São Paulo, Brazil.
Rev. Paraguaya	Revista Paraguaya. Asunción, Paraguay.
Rev. Philol. Hist. Rio de Janeiro	Revista de Philologia e de Historia, Archivo de Estudos sobre Philologia, Historia, Ethnographía, folclore e critica literaria. Rio de Janeiro, Brazil.
Rev. Popayán	Revista Popayán. Popayán, Colombia.

Rev. Real Acad. Cienc. Exact. Fís. Nat. Madrid.	Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales de Madrid.
Rev. Rio de la Plata	Revista del Rio de la Plata, Periódico Mensual de Historia y Literatura de América. Buenos Aires, Argentina.
Rev. Serv. Patr. Hist. Art. Nac.	Revista do Serviço do Patrimonio Historico e Artistico Nacional, Ministério da Educação e Saude. Rio de Janeiro, Brazil.
Rev. Soc. "Amigos Arqueol."	Revista de la Sociedad "Amigos de la Arqueología." Montevideo, Uruguay.
Rev. Soc. Argent. Cienc. Nat.	Revista de Sociedad Argentina de Ciencas Naturales. Buenos Aires, Argentina.
Rev. Soc. Cient. Paraguay	Revista de la Sociedad Científica del Paraguay. Asunción, Paraguay.
Rev. Sud-Amer. Cienc. Med. Farm.	Revista Sud-Americana de Ciencias Medicas y Farmaceuticas. Buenos Aires, Argentina.
Rev. Sudamer. Morfol.	Revista Sudamericana de Morfología. Concepción, Chile.
Rev. Trim. Inst. Ceará	Revista Trimensal do Instituto do Ceará. Fortaleza, Ceará, Brazil.
Rev. Trim. Inst. Hist. Geogr. Brasil	Revista Trimensal do Instituto Histórico e Geográphico Brasileiro (*or* do Brasil). Rio de Janeiro, Brasil.
Rev. Trim. Inst. Hist. Geogr. Ethnogr. Brasil.	Revista Trimensal do Instituto Histórico, Geográphico e Ethnographico do Brasil. Rio de Janeiro, Brazil.
Rev. Univ. Arequipa	Revista da la Universidad de Arequipa. Arequipa, Perú.
Rev. Univ. Buenos Aires	Revista de la Universidad de Buenos Aires.
Rev. Univ. Cat. Bolivariana	Revista de la Universidad Católica Bolivariana. Medellín, Colombia.
Rev. Univ. Cat. Chile	Revista Universitaria, Universidad Católica de Chile. Santiago de Chile.
Rev. Univ. Cat. Perú	Revista de la Universidad Católica del Perú. Lima, Perú.
Rev. Univ. Cuzco	Revista Universitaria, órgano de la Universidad Nacional de Cuzco. Cuzco, Perú.
Rev. Univ. Nac. Córdoba	Revista de la Universidad Nacional de Córdoba. Córdoba, Argentina.
Rev. Univ. Rio de Janeiro	Revista da Universidade do Rio de Janeiro. Rio de Janeiro, Brazil.
Riv. Antrop.	Rivista di Antropologia, Società Romana di Antropologia. Rome, Italy.
Secret. Agric. Indust. Comer.	Secretaria de Agricultura, Industria e Comercio. São Paulo, Brazil.
Sitzung. Akad. Wissen. Wien	Sitzungbericht der Kais. Akademie der Wissenschaften in Wien. Math.-Naturwisse. Kl.

Sitzung. Antrop. Gesell. Wien.	Sitzungsberichte der Anthropologischen Gesellschaft in Wien.
Sitzung. Gesell. Naturf. Freunde Berlin.	Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin.
Sitzung. Math.-Physik. Cl. K. Bayer. Akad. Wissen. Munich.	Sitzungsberichte der Kgl. Bayerischen Akademie der Wissenschaften zu München. Math.-phys. Kl.
Sitzung. Philos.-Histor. Kl. K. Akad. Wissen. Vienna.	Sitzungsberichte der Philosophisch-Historische Klasse, K. Akademie der Wissenschaften. Vienna.
Smithsonian Misc. Coll.	Smithsonian Miscellaneous Collections, Smithsonian Institution. Washington, D. C.
Smithsonian Scient. Ser.	Smithsonian Scientific Series. New York, N. Y.
Soc. Bíbl. Británica Extran.	Sociedad Bíblica Británica y Extranjera. London, England.
Soc. Chil. Tisiol.	Sociedad Chilena de Tisiología. Santiago de Chile.
Sphinx	Sphinx, Revista Bimestral del Instituto Superior de Lingüística y Filología de la Universidad Mayor de San Marcos. Lima, Perú.
Tag. Deutschen Anthrop. Gesell.	Tagungsberichte der Deutschen Anthropologischen Gesellschaft. Halle, Germany.
Terre et Vie	La Terre et la Vie, Revue d'Histoire Naturelle. Paris, France.
Trans. Amer. Ethnol. Soc.	Transactions of the American Ethnological Society. New York, N. Y.
Trans. Amer. Philos. Soc.	Transactions of the American Philosophical Society. Philadelphia, Pa.
Trans. Conn. Acad. Arts Sci.	Transactions of the Connecticut Academy of Arts and Sciences. New Haven, Conn.
Trans. Ethnol. Soc. London	Transactions of the Ethnological Society of London. London, England.
Trav. Mém. Inst. Ethnol. Univ. Paris.	Travaux et Mémoires de l'Institut d'Ethnologie, Université de Paris. Paris, France.
Treb. Soc. Biol. Barcelona	Treballs de la Societat de Biologia. Barcelona, Spain.
Univ. Calif. Publ. Amer. Archaeol. Ethnol.	University of California Publications in American Archaeology and Ethnology. Berkeley, Calif.
Verhandl. Berlin. Gesell. Anthrop. Ethnol. Urg.	Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte. Berlin, Germany.
Verhandl. Deutscher Wiss. Ver. Santiago.	Verhandlunger des Deutscher Wissenschaftlicher verein zu Santiago de Chile.
Verhandl. Schweiz. Natur. Gesell.	Verhandlungen der Schweizerischen Naturforschenden Gesellschaft. Zürich.

Viertel. Naturf. Gesell. Zürich	Vierteljahrschrift der Naturforschenden Gesellschaft in Zürich.
Viking Fund Publ. Anthrop.	Viking Fund Publications in Anthropology. New York, N. Y.
Ymer	Ymer. Stockholm, Sweden.
Zeit. Ethnol.	Zeitschrift für Ethnologie. Berlin, Germany.
Zeit. Förd. Brasil.	Zeitschrift zur Förderung der Brasilkunde. São Paulo, Brazil.
Zeit. Franz. Sprache Litt.	Zeitschrift für Französische Sprache und Litteratur. Oppeln; Leipzig.
Zeit. Gesell. Erd. Berlin	Zeitschrift der Gesellschaft für Erdkunde zu Berlin. Berlin, Germany.
Zeit. Morph. Anthrop.	Zeitschrift für Morphologie und Anthropologie. Stuttgart.
Zeit. Rassenk.	Zeitschrift für Rassenkunde.
Zeit. Rassenphysiol. Munich	Zeitschrift für Rassenphysiologie, Mitteilungen der Deutschen Gesellschaft für Blutgruppenforschung. Munich.
Zool. Gart.	Der Zoolischer Garten. Leipzig, Germany.
Zoologica	Zoologica, Scientific Contributions of the New York Zoological Society. New York, N. Y.

ABBEVILLE, CLAUDE D'. *See* GARCÍA, R., 1927.

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1938 b. Os Caxinauás. *In* "Ensaios e estudos (critica e historia)," 3a Serie, pp. 275–357. Rio de Janeiro.

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1879. Du parler des hommes et du parler des femmes dans la langue caraïbe. Extrait des mémoires de l'Académie de Stanislas pour 1878. Paris.

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1890 a. Trois familles linguistiques des bassins de l'Amazone et de l'Orénoque. Congr. Int. Amér., Sess. 7, Berlin, 1888, pp. 489–497.

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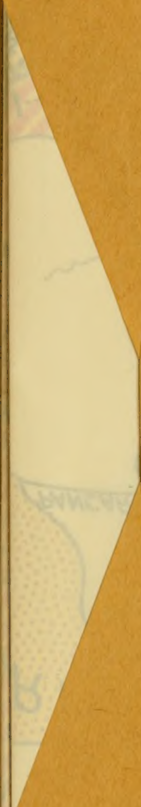

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